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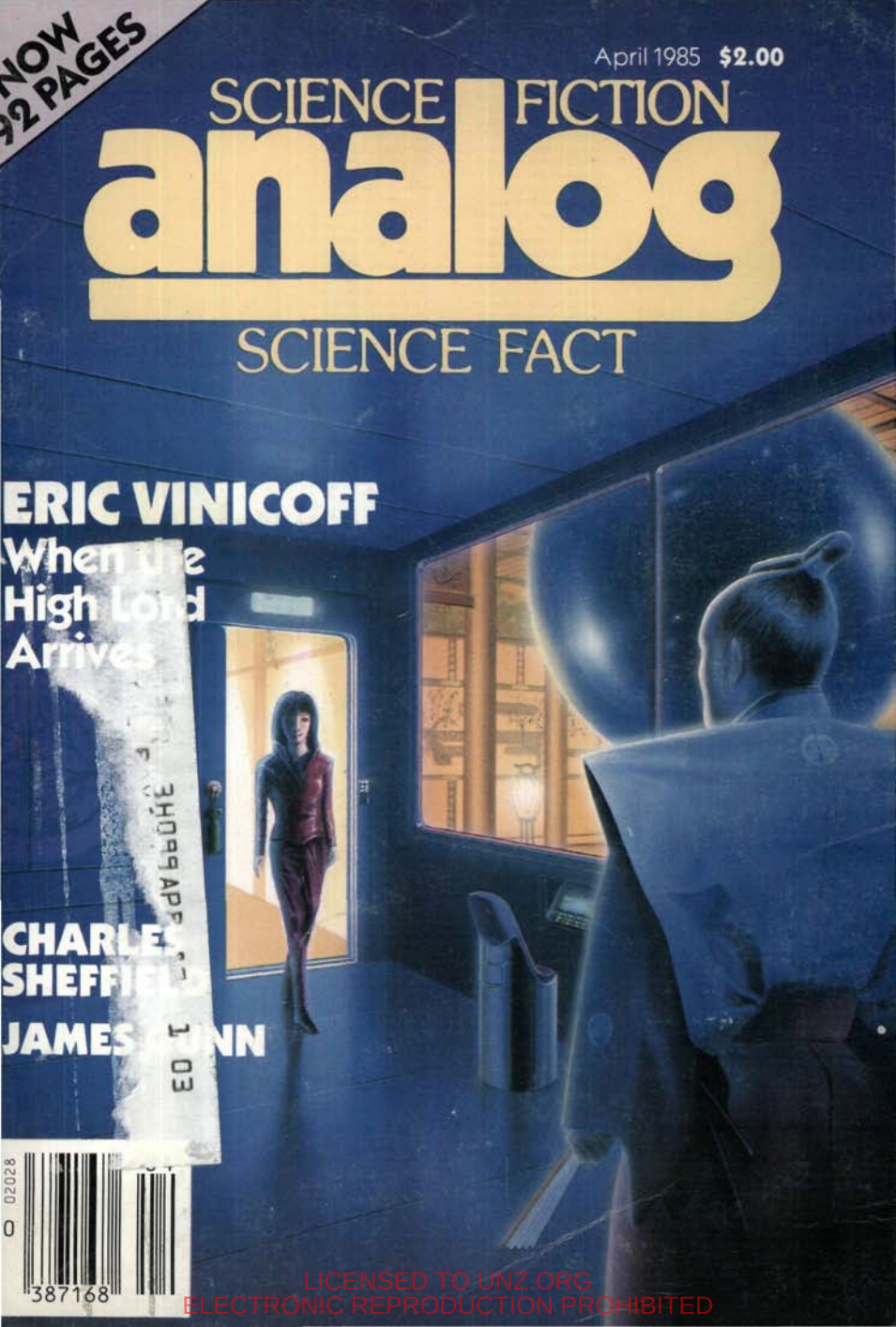

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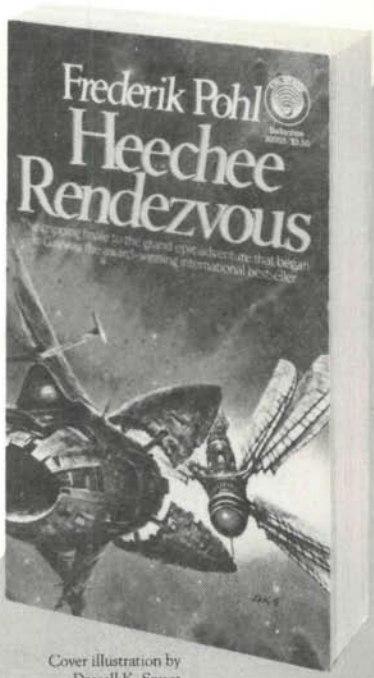

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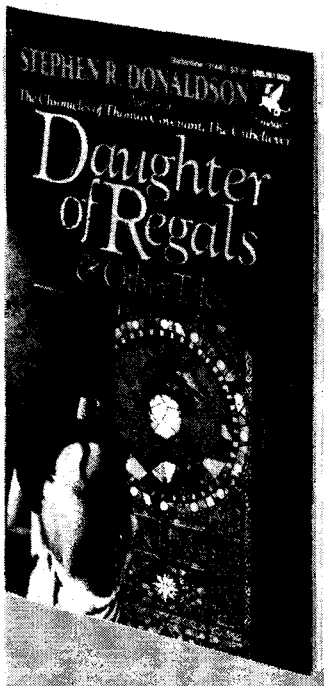

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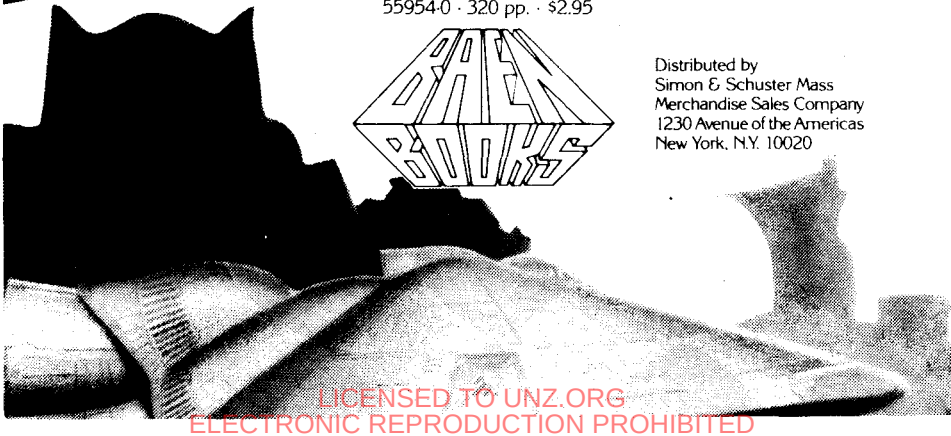

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analog

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Serial

BETWEEN THE STROKES OF NIGHT, Charles Sheffield, Part Two of Four ____ 62

Novelettes

WHEN THE HIGH LORD ARRIVES, Eric Vinicoff ____ 8
MOTHER OF THE YEAR, James Gunn ____ 138

Science Fact

THE LOST DIMENSIONS OF REALITY, John Gribbin ____ 38

Short Stories

THE GETAWAY SPECIAL, Jerry Oltion ____ 42
BUT FIRST A MESSAGE . . . , Rick Shelley ____ 110
RIDE A DARK HORSE, Bob Buckley ____ 126
THY NEIGHBOR'S ASSETS, Kevin O'Donnell, Jr. ____ 160
MUSIC HATH CHARMS, Timothy Zahn ____ 170

Reader's Departments

THE EDITOR'S PAGE ____ 4
BIOLOG ____ 61
IN TIMES TO COME ____ 125
THE ALTERNATE VIEW, John G. Cramer ____ 121
ON GAMING, Dana Lombardy ____ 137
THE REFERENCE LIBRARY, Tom Easton ____ 179
BRASS TACKS ____ 186
THE ANALOG CALENDAR OF UPCOMING EVENTS ____ 192

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CORRECTION

Last month's issue featured "Hot Rocks and Water," a science fact article by Richard Patrik Terra. It was mistakenly attributed in the Table of Contents to G.F.R. Ellis and Tony Rothman. The Ellis/Rothman article, "Garden of Cosmological Delights," will appear next month.

Indicia on Page 6

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Editorial

SPEAK FOR YOURSELF...

Stanley Schmidt

The editor of a magazine like *Analog* is in an unusually favored position for being exposed to a wide range of information and ideas. Not only does he see many of the usual public and not-quite-so-public sources in the normal line of duty, but readers all over the world and in all sorts of occupations regularly send him clippings he might otherwise miss—to say nothing of sending their own ideas and opinions. Sometimes a couple of these items fall together in odd ways.

In the last couple of weeks (which, because of our long lead time, fell during the height of the pre-election circus) I found myself watching a *Sixty Minutes* documentary on the ethical problems of legislators' accepting contributions from political action committees (PACs). At about the same time, I heard from a reader who was annoyed by some of my editorial comments concerning the "soft sciences" like sociology and economics. There are at least some such areas, my loyal critic claimed, which have at least attained the status of good engineering technology. Advertising, for example, can predict with rather high accuracy what people will buy and how their desires can be modified to suit a company's needs.

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At this point something clicked. One of the things I heard congressfolk saying in defense of accepting PAC money (which, in itself, is *not* my main issue for today) was that without such funding they simply couldn't afford to compete for office, largely because of the necessity of buying lots of expensive media advertising. And I thought: why should they be buying expensive media advertising at all?

The obvious answer, of course, is that their election-year opponents do so, and if they didn't do likewise they would be at a politically fatal disadvantage. But if *none* of the candidates were using Madison Avenue to campaign . . .

Time was, I'm told, when it was considered a breach of professional ethics for lawyers to advertise. Maybe we need something like that for political candidates.

But how, you may ask, are we going to know the candidates' beliefs and attitudes, and what they plan to do if elected, if they're not allowed to advertise?

To which I reply: of course you need that information, but do you really believe you're getting it in a useful form from the kind of campaign advertising we have now? Oh, there may be an occasional passing reference to such matters, but they certainly aren't the bulk of what I hear—and I've been hearing a *lot* lately. Most of what I hear is snide allegations and innuendoes about the evils of the opposition, glowing but vague reminiscences of the candidate's own past, and even more glowing but vague promises about his post-election future. All of this is underscored by music and visual imagery that go straight for the emotions, in the best manipulative traditions of professional advertising.

And may the best agency win.

Now, I don't agree that advertising is really a predictive science, or even a real engineering-level craft. If it were, there wouldn't be so many companies wasting their time making products that don't sell well. All they'd have to do would be to hire someone well versed in The Principles to make sure that didn't happen.

But it is true that *some* ad men *are* pretty good at swaying the public. A slick enough ad can indeed make lots of people buy just about anything for reasons which have very little to do with the merits of the merchandise.

Do we really want to be governed by men and women who are chosen not for how good *they* are, but for how good their make-up men and publicity managers are? If not, maybe we'd be better off with the make-up men and publicity managers out of the picture. Yes, voters need information about the candidates; but they don't need slick, highly competitive hype.

Suppose we ban commercial advertising by political candidates, and instead provide a number of outlets where the candidate himself can state his views on the issues and what he proposes to do about them. No razzle-dazzle, nothing fancy—just an opportunity for him to stand up, state his platform, and answer questions, with no unnecessary embellishments. I envision things like

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strictly limited column space in newspapers, brief "talking head" appearances on television, and perhaps an occasional debate or interview—all within a time frame and space allotment adequate to let the candidate express his stand clearly and completely, *if* he's thought it out well enough to express it succinctly, but no more. If he *hasn't* thought it out that well, that fact in itself is worth knowing. In any case, forcing every candidate to speak for himself, unaided by any theatrical razzle-dazzle concocted by media professionals, should bring the actual differences among *candidates* into considerably sharper focus.

Since such a campaign would cost much less than the present kind, it should also substantially reduce the need to accept outside money to finance campaigns, and reduce all the troublesome ethical questions appertaining thereunto. And maybe—just maybe—it would even widen the field of candidates by reducing the importance of prior wealth as a prerequisite for running for office. ■

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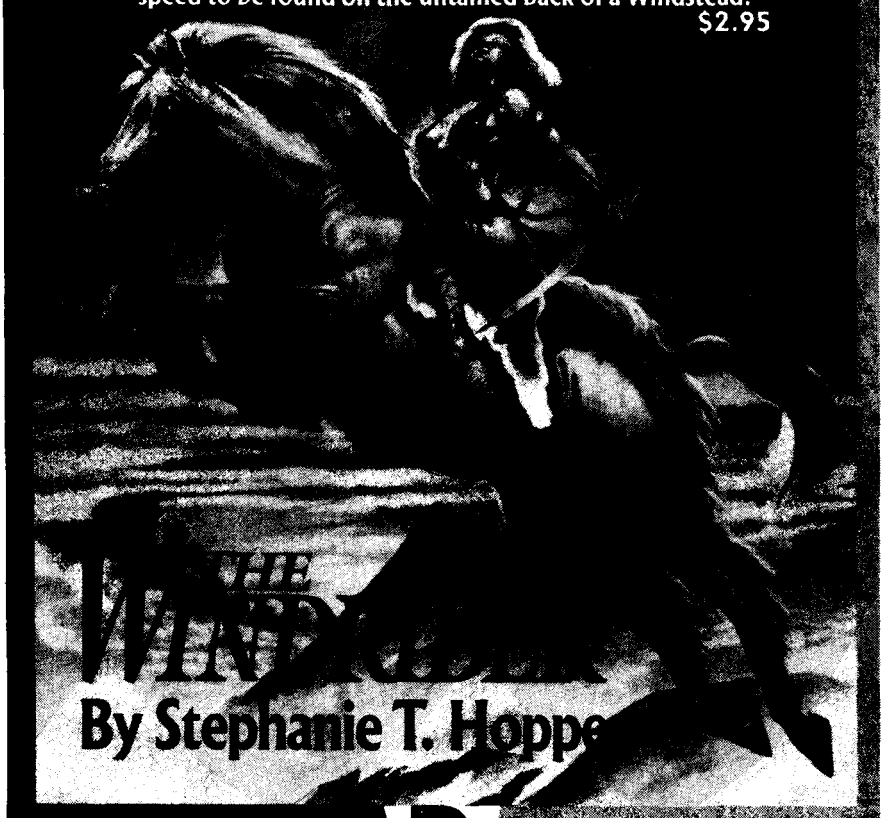

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Hans Jarkus
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WHEN THE HIGH LORD ARRIVES
Customs are a society's adaptations to needs. As one changes, so must the other—and a set long put aside may find new uses.

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Lord Hiroshi sat cross-legged on the grass at the edge of the cliff, playing his lute. Wind and warm rain battered him, while almost continuous lightning threw jagged brightness across the rushing clouds. Below him black waves pounded at the lava face of the cliff. The Sea of Japan-that-was slept restlessly.

He played a tune that rode the shrieking wind and dove through the crashes of the surf. He traveled with it, out of himself. Freed from his power, his responsibilities and his karma. As one with the storm.

A gong sounded in the depths of the earth. He blinked. Everything was gone, replaced by the dull gray walls of the environment room.

He rose—drops ran from his silk kimono to the tiled floor—and went to the door. Four of his household samurai stood in the hallway like living ancestral statues. They fell in behind him as he walked to his bath, a presence he would only have noticed by its absence.

Hiyata, his body servant for well over a hundred years, bathed and toweled him dry, then bound up his hair and dressed him. A light breakfast awaited him on the marble table when he entered his private garden. He sat and began to eat.

His thoughts returned inevitably to the impending crisis. He had done everything he could, which was too little. As Nakai Corporation's acting director for the Solar System his word was policy in most matters. But High Lord Nakai himself had determined the need and ordered the installation of the war satellites around Earth. Only he could answer the demands from the Commonwealth for their removal.

So six years ago he had cut short his tour of Nakai Corporation's extra-solar holdings and started on the journey home. He would arrive in fifty-seven hours. Lord Hiroshi could only guess at how he would deal with the situation.

A delegation from the Commonwealth would be arriving within the hour. Lord Hiroshi had no role in the welcoming ceremony; ordinarily he wouldn't have given it more than a moment's thought. However Valarie Samario was a member of the delegation. A purely personal matter, yet her arrival filled his thoughts almost as much as the High Lord's.

He summoned his open limousine, and it pulled up to the palace entrance just as he stepped outside. The air was crisp and laden with the fragrance of the many blossoming cherry trees. He looked up at the cloudy holographic sky with some irritation—was Environment Control planning to rain on the welcoming ceremony?

"Good morning, Lord Hiroshi," the limousine's pseudovoice said as he climbed into the back seat and the samurai mounted the running boards. "How may I serve you?"

"Take me to the Port VIP reception center. And find out if any rain is scheduled for today."

"No rain is scheduled for today, Lord Hiroshi." The limousine crossed the palace grounds, cleared the gate, and followed the wide avenue past the palaces of the lesser lords. Behind him, at the end of the avenue, workers were busy preparing the High Lord's palace for its master.

Passing through the Gate of the Lords and a strip of wooded parkland, the lim-

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ousine moved almost silently into a residential level of whitewashed cottages. Lord Hiroshi sat erect, staring straight ahead. The High Lord had taught him that the stockholder-citizens needed to see their lords as lords at all times.

The limousine drove up ramps through level after level toward the Core. The traffic and pedestrian flows were thick in the commercial and public districts. Everything was clean, glistening and/or well maintained. Even the youngest of the children marching to school used subvocalizers to talk to each other; the dominant sounds were robins chirping, glass chimes ringing in the light breeze, and the subdued pulse of a properly run city. According to Central Records the population of Astarte was nearing one million.

He was pleased with his role in life. But what would happen to the stockholder-citizens in his care if the High Lord found it necessary to make war against the Commonwealth? That fear was his companion during the long days and sleepless nights.

The city's centrifugal 'gravity' dropped steadily as the limousine approached the Core; its fat tires were needed for traction. Industry and agriculture made use of the low-g, and the Port facilities surrounded the accel/decel shaft that ran the entire fifteen kilometers of Astarte's long axis.

The limousine arrived at the Port and parked next to the VIP reception center. "Has the ship with the delegation from the Commonwealth of Earth docked yet?" he asked the limousine.

"Yes, Lord Hiroshi. It's in Berth A16. Environment Control is clearing it."

Lord Hiroshi entered the center and climbed the stairs leading to the observation room. His samurai took up positions by the door as he went in.

The room was long and narrow and dimly lit. A row of chairs faced a one-way glass window looking down on the reception hall. One of the chairs was occupied. They exchanged bows, then Lord Hiroshi took the seat next to the young man.

Hiru Tamiko was only twenty-nine years old and had not yet been outside the Solar System. He was Lord Hiroshi's protegé. "For recognizing the wisdom of being here," Lord Hiroshi said, "you score eight out of ten. Now tell me why I'm here."

"To learn what you can about the delegation members, Lord Hiroshi, so you can better advise High Lord Nakai during the negotiations."

"Nine out of ten. Why are we here instead of greeting them personally in the hall?"

"Because a corporate lord would lose face meeting with mere agents of a foreign power."

"Ten out of ten." Lord Hiroshi smiled. "In a century or two you may amount to something."

"Thank you, Lord Hiroshi."

The reception hall was temple-like in its elegance: a marble floor—textured for traction—teak walls and ceiling, paper lamps, murals by Watanabi, and fixtures of gold from Mercury. The observation room window was also the mirror behind a bar with living bartenders. Twelve Nakai Corporation officers, led by the VP in charge of Earth liaison, stood in a row like samurai in business suits.

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The artistic centerpiece was a five meter hologlobe suspended from the ceiling. It held black space and bright stars. The detailed silver cylinder that was Astarte floated in the middle; as he watched, a freighter shot from the accel/decel shaft opening at one end.

The delegation members followed their guides into the hall, and marched past the Nakai Corporation row for the formal welcoming. There were twelve of them, but Lord Hiroshi's interest focused on the next to the last. He recognized Valarie from the holophotos he had acquired. At thirty-eight she was in the prime of her exotic Eurasian beauty; tall and slender around the waist, with flowing raven hair and deep, dark eyes. She wore an expensive but conservative suit appropriate to her position as a junior attache in the Commonwealth's Foreign Service. He wondered, as he had many times before, if she had chosen her career with this meeting in mind.

The leaders of the two groups went to the podium and made their brief welcoming speeches. Then the ceremony broke into individual conversations, many of them gravitating toward the bar. Lord Hiroshi turned to Hiru Tamiko and said, "Please invite Mme. Samario to join me here."

The protegé wasn't yet skilled at hiding his surprise, but he said, "Yes, Lord Hiroshi," and left the room.

A few minutes later the door opened again, and Valarie Samario entered. Hiru Tamiko showed his good judgment by waiting outside.

She had the *gaikoku*'s usual difficulty with low-g walking, but still managed to look graceful. She returned his bow properly. Her lovely smile and cool eyes revealed nothing of the thoughts going on behind them.

He had no idea how much her mother had told her. For years he had planned what to say at this moment, but now all those words deserted him. Uncertainty was a rare thing for him, and it made him uncomfortable. Or was it the emotions he felt—emotions he had never learned to master because the *Uchu-giin* had forgotten them.

"Thank you for accepting my invitation, Mme. Samario."

"You honor me, Lord Hiroshi." She didn't go on to ask him why he was violating tradition. He decided that either she didn't know the truth, or she was as unprepared as he to discuss it now. He would wait for the appropriate time.

"Your delegation is scheduled today for a tour of Astarte. I would be gratified if you would let me extend you the same courtesy personally."

"Thank you, that's most gracious. Of course I accept." Again she didn't ask why.

"What sights would you like to see?"

"Whatever you feel I would profit most from seeing."

He escorted her to the limousine. As it drove toward another part of the Core, he noticed that she was glancing unobtrusively at the samurai. Amusement tugged at the corners of his mouth. "Do our customs seem a bit anachronistic to you?" he asked.

"Different lands, different customs. I've studied yours, naturally, but I don't see how some of them have survived in your modern society."

"They didn't survive. They reap-

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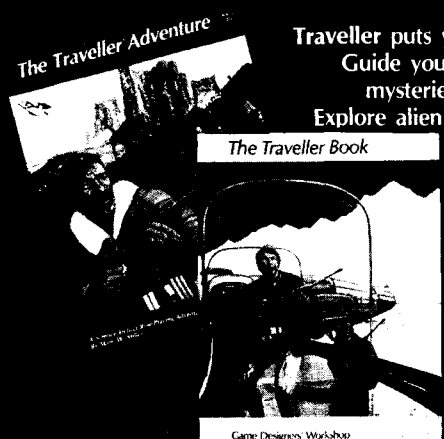

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peared when conditions again required them."

"Excuse me, Lord Hiroshi, but I don't understand."

He took a deep breath and let it out slowly. "Hundreds of years ago several nations began the commercial exploitation of space. Most of those ventures failed totally and horribly. Life in space was much less forgiving than on Earth. The stress was almost unendurable, and a simple mistake could cause mass death and destruction. The individualistic *gaikoku* lacked the self-discipline needed to survive. The specifics varied, but the end was the same.

"Only the space ventures of Japan-that-was thrived, due to its unique heritage of living and working closely together. The years in space have strengthened this heritage. The ventures became corporate feudal states. In an environment where swords were the only safe weapons, bodyguards and police became samurai. Senior executives whose lives were extended over centuries by interstellar travel became a new nobility."

"Forgive me, Lord Hiroshi, but that sounds rather cynical."

He paused. "So it might to a *gaikoku*. But our customs are neither cynical nor naive. They are the creation of our needs."

In rooms at four different hotels three men and a woman opened their travel bags at exactly the same time. They seemed to be Uchu-giin *visiting Astarte on business from other space cities. They were young and physically fit, but otherwise undistinguished in appearance. They had attracted no attention, made no acquaintances. None of them had as much as passed any of the others in the street.*

Their passports were fantasies; their actual identities were known only to a few Commonwealth military officials. The covers had been carefully arranged. Cutthroat industrial espionage had honed the Nakai Corporation's security department to high efficiency.

They opened hidden compartments in their bags, removed certain tools of their trade, and put them in their belt pouches.

Checking their infotrieves for the time, they left their hotel rooms at the same moment.

Lord Hiroshi sat with Mme. Samario in an observation room overlooking Central Operations Control; a visit in person would have disrupted the work. COC was a vast circular floor space crowded with hundreds of consoles and busy personnel. Lord Hiroshi watched its orderly and quiet functioning with pride.

"Is Astarte run from here?" Mme. Samario asked.

"Life-support and other city services are supervised elsewhere. This is where the business activities of the Nakai Corporation are directed."

"They seem to be extensive. Mostly interstellar transportation and communications, if I'm not mistaken?"

"The Nakai Corporation began as a mining venture on Mercury. But you are correct. We monopolize the business by virtue of owning the only two launchers in the Solar System. They are prohibitively expensive to build."

He whispered an instruction into his

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infotrieve. The holoscreens on their chair armrests filled with a view of space from Astarte's outer hull. Doughnut shapes floated in a line disappearing into the blackness, aligned hole to hole, the gaps between them increasing regularly. Near them was what looked like a silver crescent moon. "This is the North launcher; the reason Astarte was built here three AU's above the gas and dust of the ecliptic. The South accelerator rings and catcher's mitt cover the other half of the celestial sphere."

"Catcher's mitts, Lord Hiroshi?"

He smiled. "A nickname derived from one of our popular sports. I understand it isn't played on Earth anymore. They are twelve kilometer parabolic antennae that receive the laser pulses from other solar systems; the messages and the passengers."

He switched to a view of a big room in which workers swarmed around a streamlined space probe. "The next scheduled launch is a biological package for the Tau Ceti system. The launcher and its light sail brake will bring it to its destination in twenty-one years."

She stared at the activity beyond the window. "Do you operate the war satellites from here?"

"Direct control is maintained from Luna, but the monitoring station is over there." He pointed to a cluster of consoles, forgetting to use the holoscreens in his irritation at her bluntness.

"Very impressive," she said levelly. "From here, at your whim, you can destroy any part of Earth that displeases you."

"Either you don't understand the situation, which I doubt, or you are deliberately distorting it. What we are doing is for your benefit as well as ours."

"The rationale of all tyrants."

He forced the anger from his mind before commenting. "We have never interfered in your politics."

"You make us pay tribute."

"We charge you for the cost of maintaining the satellites plus a fair profit. In turn we prevent a repetition of the nuclear warfare that almost ended all life on Earth."

"By destroying every effort to recreate nuclear technology—at whatever price in human life? We don't want another Last War either. But we intend to reassert Earth's right of self-determination."

He sighed, and let his thoughts journey back. "One hundred and ninety years ago, during the Last War, Japan-that-was sank beneath the sea in earthquakes triggered by nuclear bombs. We took a terrible revenge on the nation responsible. It no longer exists."

"You make it sound like you were there."

"I was. I carried out the High Lord's decision." He looked at her through his pain. "I don't want to have to do so again."

"Then don't. Tend to your businesses, and let us run our world."

"The issue isn't that simple, as you know. We depend on Earth for trade and organic materials, and most of all the fertilized embryos that we import from *nisei* communities. To protect these we must prevent you from destroying yourselves."

"We aren't children." A frown broke through her professional mask. "Maybe after the war, when ruined nations were

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squabbling over crumbs, your firm hand was needed. But the Commonwealth is keeping the peace now. We can't fight you—but we can cut off all trade. You know what that would mean."

He nodded. "A test of wills that none of us might survive. But I have little say in this matter. We must wait for the High Lord's arrival."

One of the three men who looked like Uchu-giin *walked along a dimly illuminated corridor. It was in an area of Astarte that was off-limits to unauthorized personnel, but the ident circuit in his infotrieve was transmitting a proper code. The corridor was deserted this time of shift.*

He stopped in front of a ventilation grate. Taking an electronic device from his belt pouch, he pressed it against the grate and read its tiny datascreen. Satisfied, he put it away. Then he removed the grate.

He pulled a dark plastic ball the size of a baseball from the pouch. When he touched a circular indentation on it, six spider-like legs popped out. He set it down inside the vent, and it started walking along the air shaft. He allowed himself a brief smile as he refitted the grate in place.

He checked the time, and turned to leave the way he had come.

Lord Hiroshi and Mme. Samario were in a wide corridor that lacked the traditional odor of what it was—part of a hospital. The samurai formed a phalanx around them. The corridor was busy, but everyone stopped and bowed as Lord Hiroshi passed.

She hid her typical democratic distaste well, but not perfectly. He said, "You should remember that our nobility isn't—couldn't possibly be— hereditary."

"Is that supposed to make a difference?"

"Yes. Life in space is too demanding to maintain the myth of human equality. There are superior people."

"Such as yourself?"

The question would have been unforgivably direct from an *Uchu-giin.* But he controlled his anger and explained patiently. "The stockholder-citizens elect the Board of Directors, which employs and discharges all officers up to and including the High Lord himself. Good judgment is vital to everyone's survival; we reward it, and we honor it."

But he could tell that she was unconvinced.

The observation room they entered looked down on a big room that was part maternity ward and part laboratory. No sounds penetrated the thick windows, but the dominant one was plainly the crying of babies. Dozens of nurses moved between unusual tub-like cribs cluttered with pipes and wires and equipment. In the far end of the room doctors and technicians worked around glass tanks filled with amber fluid. Dark objects floated in the fluid.

Mme. Samario pointedly looked away from the tanks. "I'm surprised that with all of your scientific abilities you haven't been able to solve your fertility problem."

"It is an ongoing top-priority research effort, but we are no nearer to a solution than we were two centuries ago. The connection between lunar

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tides, menstrual cycles and fertility is a fact. We learned that when we left Earth and stopped having babies."

"Isn't it due to some sort of hormone deficiency?"

"Yes, but what sort? I am told by those who are studying the problem that the relationship is maddeningly subtle and non-specific. Actually our best hope lies in another direction: an adaptation of the cloning technology we use to grow the bodies for our interstellar passenger transmitting. The obstacles are inbreeding and the deterioration of our gene pool due to radiation."

"But for now your culture depends totally on Earth for its children."

That required no answer, so he gave none.

The room looked like a surgical operating theater. Medical equipment, computer consoles, and several coffin-like forced growth tanks lined the walls. Cables and pipes ran across the gleaming white floor to a glass tank in the room's sunken center. Over a dozen doctors, technicians and nurses were at work.

Inside the glass tank an adult human body floated in amber fluid. Wires left the tank from metal disks attached to its bald head.

The room's door slid open. Four samurai guards drew their swords, but explosions ripped open their chests. They fell. Three men and a woman jumped over them into the room.

Alarms sounded. The workers froze in surprise for a moment, then they rushed at the attackers or shielded the glass tank with their bodies.

All of them died in seconds. The attackers held bulb-shaped devices that fired explosive darts.

The attackers quickly consolidated their position. One sprayed the door with a superadhesive compound and closed it. Another piled the corpses out of the way. A third installed explosive charges on the glass tank, then went around the room disabling the monitor cameras.

The fourth sat down in front of the com console and told it to put through a call.

The garden where Lord Hiroshi entertained guests was in a larger court of his palace than his private garden. Golden carp played in ponds amid exotic plants from Earth and *Uchu-giin* botanical laboratories. Birds sang in blossom-laden branches.

He sipped his tea, and looked across the marble table as Mme. Samario sipped hers. He couldn't spare much more time for this personal matter; corporate business awaited his attention, the most important of course being the High Lord's arrival. He would have to be regrettably direct.

"I have enjoyed showing you some of our community," he said.

"Thank you, Lord Hiroshi. I enjoyed seeing it, and I learned a great deal."

He put down his cup. "But aren't you curious why a lord of the Nakai Corporation acts as a tour guide for a junior Commonwealth official?"

She frowned, and in that frown he saw that she knew. Part of her mask had fallen away. He sensed nervousness, which he expected, and something else that worried him. Something malignant.

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"No. But I've been waiting for you to raise the subject."

"Very well. Did your mother ever tell you anything about me?"

"She told me that you're my father."

He sighed. The moment was here, and he didn't feel at all the way he had imagined he would. He wasn't sure what he felt, except a powerful need for her to understand. "Your mother was doing research at the observatory here. I met her socially, and we fell in love. An almost unique event, since the racial emnity between *Uchu-giin* and *gaikoku* was as strong then as it is now. It ended when she returned to Earth and I was sent to inspect our Tau Ceti holdings. But before we parted she told me she wanted to have my child. Being recently arrived from Earth, her menstrual cycle hadn't yet been affected.

"It was against our customs, but I was very much in love. Also, I admit the idea of having a son or daughter was alluring. So I agreed.

"Your mother was dead when I returned, and I thought it best not to intrude in your life. I did keep track of your career, and felt pride at your successes. I hope your presence here is due to your desire to meet me."

She was nervously twisting a ring on her right hand. The malignant emotion was more distinct. He couldn't define it or guess at its cause, but it was building toward some sort of eruption. "You loved mother," she said tonelessly. "And she loved you—she told me that often enough. So the two of you created a trophy for your love. Me."

"I don't understand your point."

"You wouldn't!" She flushed dark red. "Mother didn't suspect—she knew nothing about *Uchu-giin* medicine—but you should have!"

He felt confusion and even fear. What was she talking about? What could have caused such rage? Surely nothing so commonplace (on Earth) as his failure to be a traditional father. *Uchu-giin* medicine? He looked at her . . . let his mind hunt. . . .

He bowed his head, overwhelmed by a sudden terrible shame.

His peripheral vision caught a blur of motion. He looked up, and saw a tableau so strange that it took him a moment to make sense of it.

Matsunaga, the chief of his household samurai, had been standing at the edge of the garden. Now he was behind Mme. Samario. Her right arm strained futilely against his oaken grip. Her hand had become a fist with the ring—which had somehow acquired a needle tip—aimed at Lord Hiroshi's chest. It had been stopped a few centimeters short of its goal. Her face was twisted by effort and hate.

She changed her tactics, clawing back at Matsunaga's eyes with her free hand. The move showed specialized training, but the samurai had been similarly trained and had a physical advantage. He caught the hand, kicked the chair out from under her, and jerked her upright. Then he struck a karate blow with his forehead against the back of her head, stunning her.

Holding her up with one hand, he removed the ring and searched her thoroughly. "Lord Hiroshi," he rumbled, "it is likely she has a means of committing suicide, and will use it when she regains her senses."

Lord Hiroshi had to struggle to think

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clearly. He focused on this one problem. "Can you prevent it?"

"Yes, Lord Hiroshi. The mechanism would be subcutaneous, triggered by muscular motions." He removed an injector from his belt pouch, touched various parts of her body, then pressed it against her left hand. "This local anesthetic will prevent the triggering until we can surgically remove it."

"Well done. Hold her while I talk to her." Her eyes blinked open, and she stared at him defiantly.

He walked over to her—but not within kicking range. "You hate me this much?"

"You gave me suffering and death. I wanted to return your gift."

He was having difficulty grasping the actuality of what had happened; patricide was an almost unthinkable crime in the culture of Japan-that-was. "You don't look ill."

"Cosmetic medicine can do wonders. I have a maximum of eight months left. Leukemia. Blood and bone marrow transplants can keep a body going only so long. The fight is almost over. Contrary to popular mythology, you don't learn to live with pain—you redirect it."

"Into hate?"

"Yes! Your metal hulls are a poor substitute for Earth's atmosphere. 'Deterioration of the gene pool due to radiation.' But you went ahead and made a baby despite the risk. You didn't think, or you didn't care. God, I wept with joy when they recruited me for this mission. My part has failed, but the others are professionals, You'll die by your own hand."

He opened his mouth, not knowing what he would say, when his infotrieve sounded a series of tones that shocked him back into a functioning state of mind. A Status Two emergency. Not a One—a hull blowout—but something almost as serious. He cleared his thoughts of all personal distractions. "Matsunaga, take Mme. Samario to police headquarters. Have the suicide mechanism removed and the ring analyzed. Mme Samario is to be detained, and prevented from harming herself."

The samurai bowed and carried her out of the garden.

Lord Hiroshi hurried to the palace entrance, flanked by the remaining three samurai. He used the infotrieve to summon the limousine and call for a situation report.

The traffic was normal as he drove to the Interstel Travel complex; Lord Takahashi had set up security containment. At the complex he quickly cleared a checkpoint on full alert and parked in a garage area. There he was met by two police samurai, who escorted him to the command post Lord Takahashi had established near the laboratory held by the *gaikoku* terrorists. The corridors were empty except for police guards.

In the command post technicians were monitoring portable scanner and com consoles. An assault team was studying 3-D blueprints of the laboratory. Lord Takahashi, a chunky old man wearing the scars of many past battles, came out from behind the silk wallscreen which had been set up to turn a corner of the room into his private office. Lord Hiroshi and he exchanged bows, then went behind the wallscreen and sat on the floor mat spread there.

Lord Takahashi drew his sword and laid it on the woven bamboo between

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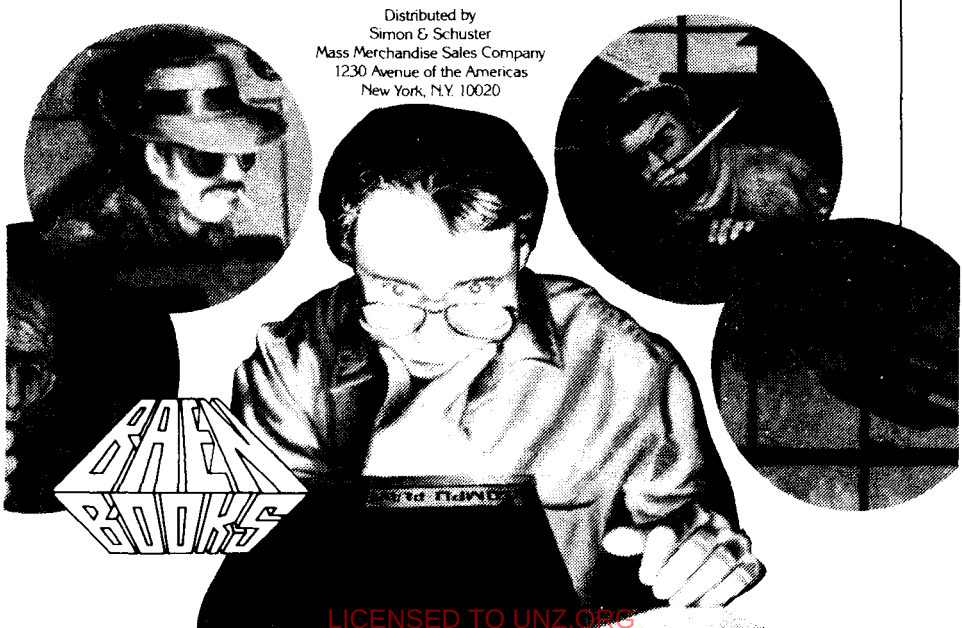

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them. "I failed in my responsibility to guarantee the safety of the High Lord's arrival. I cannot live with this shame, now that you are here to undo my failure." His voice was gravelly but firm.

Lord Hiroshi handed the blade back to him. "I am sorry, my old friend, but you must endure it for a little while longer. I will need your expert assistance in this matter."

Lord Takahashi sheathed the sword smartly. "As you command. You are aware of the steps I have taken thus far?"

"Yes, and I fully approve."

"The terrorists want to deliver their demands to you personally. Will you talk to them?"

"I suppose so, though I can well imagine what they want."

"The timing of this is curious," Lord Takahashi pointed out. "Why has the Commonwealth invalidated the impending negotiations before they have been proven hopeless?"

"An excellent question. If we manage to get any of the terrorists into interrogation, we might learn the answer." Lord Hiroshi paused. "On the way here I instructed my office to arrange a conference call to the other Corporations at 1620."

"My tactical board has prepared an attack option for your consideration. Do you wish to discuss it?"

"First I will talk with the terrorists." They walked over to a com console; the technician operating it stood up, bowed, and moved away. Lord Hiroshi sat down while Lord Takahashi called Reception Laboratory A.

The female terrorist appeared in the tiny holotank. She smiled and said, "Good day, Lord Hiroshi. I hope you're prepared to be reasonable. Otherwise you're going to lose your High Lord."

Lord Hiroshi sighed. The worst problem in dealing with *gaikoku* was their insistence on judging *Uchu-giin* motivations by their standards. "How do you know we haven't made other arrangements to receive the High Lord?"

"Because we've planned this very thoroughly. We destroyed your backup facility with a walking bomb, and you can't grow another clone body in time. Shall we talk business?"

"I assume you want the war satellites destroyed?"

She smiled again. "Nothing so wasteful. We want your control center on Luna and the access codes turned over to us. The satellites will be useful in dealing with dissidents as well as keeping you at bay."

That struck an odd chord in Lord Hiroshi, but he didn't have time to pursue it mentally. "We will have to consider your request and discuss it with the other interested parties."

"We understand that. You have twenty-four hours to make your decision. If it isn't the right one, *blam!* And of course don't try anything fancy; we'll blow up the clone tank at the first sign." The holotank went dark.

Lord Hiroshi and Lord Takahashi returned behind the wallscreen. "Let me hear your plan," Lord Hiroshi said.

"We have already attached shaped charges to a wall common with the laboratory. In two seconds my team can be engaged. The monitor cameras are out, but we are getting an acceptable view of the laboratory using sonic scan-

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ners. I guarantee four kills in under four point five seconds."

"Five kills, I fear. They will blow up the tank before you can stop them. You need some form of diversion."

"We have run simulations using all the standard possibilities, but none of them will work. The terrorists know what they are doing."

Thus far Lord Takahashi had told him nothing that he hadn't expected to hear. But he knew the cunning old samurai had something in mind. "So?"

"So I have been forced to consider a trick never attempted before. There is another body in one of the forced growth tanks, the backup clone for a passenger who arrived yesterday. Bioform Research is preparing a simulacrum program. It will be crude due to the lack of time, of course, but sufficient to establish neuromuscular control."

"To what purpose?"

"The technicians have patched into the transmit line to the tank, and can open its lid on command. My plan is to cut off the laboratory lights, then direct the clone to attack the terrorist holding the detonator—the programming will guide it. At the same time the team will engage."

"Do you have a success projection?" Lord Hiroshi asked.

"An approximation only; there are too many variables. Thirty to forty percent."

"I don't find any comfort in those odds."

Lord Takahashi nodded in agreement. "Ultimate contingencies are rarely pleasant ones. But it is available for you if you need it."

"Thank you." Lord Hiroshi stood up. "Prepare the attack for ten hours from now. I will make the final decision when I return."

They wished each other well, bowed, and Lord Hiroshi left the command post.

Hiru Tamiko fell in beside him as he returned to the limousine. "I apologize for taking you away from your sleep," Lord Hiroshi said to him. "You are about to receive an unscheduled lesson in *Uchu-giin* politics. I will brief you on the way."

Three hours later Lord Hiroshi stepped into a dimly lit circular room at the communications center. He was alone; it would have been dishonorable to allow the presence of anyone of lesser rank. His samurai were on guard just outside the door, while Hiru Tamiko observed from the engineers booth.

In the middle of the room were a desk and a comfortable chair, the only distractions from the dull gray walls, ceiling and floor. He sat down and had the desk pour him a bracingly hot cup of tea. The faint light faded to black everywhere except immediately around him.

One by one the holoimages of ten similarly seated lords appeared around the rim of the room.

There were more than a hundred *Uchu-giin* corporations. But the Eleven Corporations were the largest, and the only ones with extra-solar holdings. They didn't exactly rule the *Uchu-giin* civilization, since there was no political organization higher than the independent corporations. They led by example, by custom, and by their awesome economic power.

He had spent the past three hours in meetings to formulate a corporate harmony of policy, but now that the mo-

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ment was here he felt less than sure. More than one High Lord was in attendance. His presentation must do credit to the Nakai Corporation.

He bowed to each lord, then returned to his chair. "Thank you all for interrupting your schedules to be present," he began. "In the name of the Nakai Corporation and High Lord Nakai, I welcome you. You have received summaries of our situation. I wish your advice on the terrorists' demands, since they affect us all."

He sipped his tea while his message went out to cities around the Solar System. Long-range calls required a great deal of patience. He had the desk prepare a meal, but ate very little of it. He listened to dozens of departmental reports, seeking signs of mismanagement which would require his intervention. He spent two hours in deep meditation more refreshing than sleep. He studiously avoided the memory of a beautiful face twisted in hate.

Finally High Lord Shimada of the Shimada Chemicals Corporation said, "The demands are of course unacceptable. Turning over control of the war satellites to the Commonwealth would jeopardize the very survival of our civilization, since we would no longer be able to ensure our supply of embryos. The loss of High Lord Nakai would be regrettable, but that is your responsibility."

Lord Toho of the Nippon Electronics Corporation was even more firm. "You must not surrender the satellites, Lord Hiroshi. If you attempt to do so, we will be forced to destroy them and replace them with our own. The womb of our race must be protected."

Lord Hiroshi didn't have to consult his infotrieve to find out if Lord Toho could do it. The expertise of the Nippon Electronics Corporation was legendary. He listened to the other responses, all in the same vein, then prepared his closing statement.

"The wisdom of so many great lords is gratefully received, and shall not be ignored. I thank you for your advice. You may be confident that we won't endanger the future of our race. We will continue to provide you with updates. Now if you will excuse me, I must attend to this matter."

Though many hours had passed, his samurai and Hiru Tamiko were where he had left them. As they returned to the limousine he placed a call to his executive secretary—the director of his civic center office, which he rarely visited. "Please summon the Board of Directors into emergency session. Inform them that there may shortly be vacancies to be filled among the corporate officers."

A momentary pause, then; "Yes, Lord Hiroshi."

"A question, Lord Hiroshi?" Hiru Tamiko asked as the limousine moved through heavy shift-change traffic.

"Provided it is an intelligent one."

"You seemed to know in advance how the lords would respond. If so, why did you divert your attention from the terrorist situation to consult them?"

"First, the time was available—Lord Takahashi is attending to the tactical situation. Second, there was a slight possibility of receiving useful advice. Third and most important, in matters involving the welfare of all *Uchu-giin*

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we must expand the principle of corporate harmony."

Lord Hiroshi dropped Hiru Tamiko off at the nearest pubtrans station. Then he returned to his palace for a few hours of sleep, a bath and fresh clothes.

When he reentered the command post, he saw the assault team seated on the floor in pre-engagement meditation. He joined Lord Takahashi behind the wallscreen.

"I have considered our options," Lord Hiroshi said. "You will proceed with your attack plan. The responsibility for this decision is mine. If the attack fails, I will offer apology. I alone."

"Yes, Lord Hiroshi." Lord Takahashi bowed. "You will excuse me now please. I will be leading the attack."

He would be the first to enter the laboratory; the most likely to be cut down by the terrorists. But Lord Hiroshi could do nothing to prevent this subtle form of *seppuku* without shaming his old friend. He nodded. "Good hunting. May the gods watch over you."

After Lord Takahashi left, Lord Hiroshi had a portable monitor set up for him. The computer-enhanced holoimage based on the sonic scans gave him a reasonably clear view of the laboratory. He sat on the mat, drew his sword from its scabbard, and laid it in front of him. He would observe the attack. If it failed and doomed the High Lord, he wouldn't live with that shame a moment longer than necessary.

Valarie was never far from his conscious thoughts. An honorable death would bring an end to more than one pain.

For long minutes nothing happened. Lord Takahashi was waiting for an optimum placement of the terrorists, three of whom were moving restlessly around the laboratory. The female terrorist was seated at the com console. Her attention was being diverted by a call from a computer simulation of Lord Hiroshi asking for details of the demands. He saw the forced growth tank against the wall upon which the plan depended. Beyond the wallscreen he heard soft voices.

He had trained himself to be unaffected by tension, but he was aware of it, a rising wave that would reach its peak very soon.

Finally the terrorist holding the detonator stepped close to the forced growth tank while the other two were on the far side of the laboratory. A red light on the monitor panel turned green.

Three things happened simultaneously. The lights in the laboratory went out. He knew this because it was part of the plan and by the terrorists' reactions—the view was unchanged. A circle of explosions blew out part of the wall near the two terrorists. And the lid of the forced growth tank popped open. A naked male body jumped out amid a spray of neo-embryonic fluid, tearing free from the umbilical tubes and wires.

Led by Lord Takahashi, the six members of the assault team dove through the hole in the wall.

The female terrorist stood up quickly from the com console.

The terrorist with the detonator stabbed at the trigger button, but missed it in the darkness. He felt across the plastic face, found it and—

The clone grabbed the arm and pulled it away from the detonator. The terrorist kicked him in the groin, but he was pro-

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grammed to ignore pain stimuli. He held onto the arm.

Darts fired by the other three terrorists toward the hole in the wall caught Lord Takahashi and the team member behind him. The explosions left no question of possible survival.

The terrorist with the detonator wrestled free from the clone's grip.

The remaining four team members had flying stars in their hands, and IR helmets over their eyes. Eight of the razor-sharp spiked disks—the traditional *ninja* weapon—embedded themselves in the terrorist with the detonator. Two in each arm. Two in the neck. Two over the heart. He dropped. The explosive charges didn't go off.

The female terrorist groped in the dark for the detonator; she must have heard it fall. The team members had more flying stars on their belts. Four of them almost amputated her head from her neck.

The two surviving terrorists turned to aim their dart guns where they knew the main clone tank was. Flying stars cut them down before they could fire.

Lord Hiroshi reminded himself to take a breath, somewhat surprised by his loss of self-control. A very workmanlike operation. According to the monitor panel just under five seconds had elapsed from beginning to end. Lord Takahashi had erased his earlier shame by dying with great honor and glory.

Doctors, technicians and more samurai were rushing into the laboratory to secure it. Lord Hiroshi returned his sword to its scabbard. Oblivion was denied him. For now.

The Temple of the Lords was long and broad, a painstaking replica of the Emperor's reception hall in Japan-that-was. The air was sweet with the fragrance of cherry blossoms. Lord Hiroshi sat on a bamboo mat, his legs crossed, dressed in formal *kamishimo* and *hakama*. Behind him the twenty-six lesser lords of the Nakai Corporation were similarly seated.

None of them had moved or spoken in the three hours since the beginning of the arrival ceremony. Lord Hiroshi's thoughts had slipped the leash of his self-discipline. They wandered in dark places even as the ceremony neared its climax.

The body of High Lord Nakai rested face-up on pillows of spun gold on the dais in front of the lords. It was less than three months old, yet at the same time it was—for technical reasons had to be—an exact duplicate of the eighty-seven year old husk the High Lord had left circling a distant star. Wrinkled and bald-headed yet physically sound, it had been groomed and dressed in a simple white kimono—the color reserved to the High Lord.

Lord Hiroshi's thoughts visited a woman under restraint at the police headquarters. A woman with his blood flowing through her veins. The victim of his poor judgment. A failed patricide. He had gone to talk to her twice since the resolution of the terrorist situation. He had explained in detail the chapter of his long life that concerned her, and she had listened in hostile silence. He had ignored her hatred; he sought understanding, not forgiveness.

Three priests stood around the dais, chanting the prayer of safe passage. Around them the High Lord's household

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samurai formed a pair of concentric circles, the inner one facing in, the outer one facing out. Jeweled scabbards and flying stars glistened in the simulated candlelight. They were an ornament of the ceremony, but they were also alert and ready to kill or die for their lord.

Lord Hiroshi's thoughts saw careful and quiet preparations underway throughout the Nakai Corporation's in-system holdings, preparations that he had ordered so they would be in place if the High Lord required them. Stockpiling and budgeting essential imports from Earth. Switching over to *Uchu-giin* alternatives where possible. Calculating the sword strokes from orbit to bring down the entire Commonwealth at once—for if war came it would have to be total to prevent retribution against *nisei* communities. And coordinating with the other *Uchu-giin* corporations.

High Lord Nakai wore a crown of silver, or so it seemed. A thick wire ran from it into the dais, to the room below where technicians and doctors were intensely monitoring consoles.

Lord Hiroshi's thoughts looked ahead to a terrible future. There could be no doubt now; the terrorist attack had proved that the Commonwealth was hostile and treacherous. The safety of the Nakai Corporation, the entire *Uchu-giin* civilization, couldn't be put in their hands. High Lord Nakai wouldn't yield. The negotiations would fail. And Lord Hiroshi would be sent to Luna to be the executioner. Again.

The priests reached the end of their prayer, and backed away from the dais, bowing. Lord Hiroshi's attention returned to the ceremony. The moment of arrival was at hand.

Beyond Astarte's hull, in the cold and empty void, a laser pulse had entered the Solar System. It had spread considerably during its long journey, yet even so the job of aiming it so that it would hit the catcher's mitt had been a feat of modern technology. Most of the pulse hurried on to its unknown karma at the end of the universe. But a small part found the parabolic antenna, was relayed to Astarte, reached the room under the dais, and . . .

High Lord Nakai's eyelids fluttered open.

He reached back and removed the crown from his head. Then he slid off the dais onto his feet. He moved slowly yet certainly, with none of the awkwardness of the inexperienced interstellar traveler.

Lord Hiroshi and the lesser lords bowed, their heads touching the mats.

"Rise, lords of the Nakai Corporation. I thank you for your welcome." The High Lord's voice was a low scratchy growl, yet it was filled with authority and the joy of living. Lord Hiroshi, old and wise and cynical, felt the same awe in the High Lord's presence that he had as a young man. He understood the reverence in which the stockholder-citizens held the High Lord. It was more than wielding unimaginable power, centuries of accumulated experience, or the traditional veneration of age. Just as surviving in space had made the *Uchu-giin* a superior race, so the High Lords had become superior men and women.

The lords stood. Lord Hiroshi took the rod of office from his belt and walked to the High Lord. "The holdings of the Nakai Corporation that you placed

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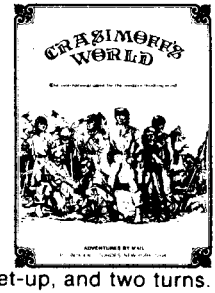

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in my care I now return to you, High Lord Nakai." He handed over the carved jade rod, and bowed.

"I accept them back, Lord Hiroshi. Find ease from your burden for a time. Soon I will have a new task for you."

Lord Hiroshi bowed again, and backed away as the lesser lords went one by one to the High Lord to show their respect. Lord Hiroshi turned and walked out of the Temple. The ceremony was over, purposefully brief so that the High Lord could retire to be examined by his doctors.

The High Lord would be very busy during the next few weeks, reviewing the corporate records for the years of his absence as well as tending to current matters. At some point Lord Hiroshi knew he would be summoned to give a personal accounting. Until then he was free to do as he pleased.

But there was no freedom for him. Not all his responsibilities could be turned over to the High Lord.

He returned to his palace, ate his supper alone, spent an hour in the environment room that failed to have its usual relaxing effect, then went to bed. After a brief and unsatisfying effort he dismissed his pillow geisha, and slept fitfully.

The next waking period he put his household affairs in order. He updated his instructions for the distribution of his personal effects; his other assets would of course revert to the corporation at his death. He made certain his servants were provided for. He spent hours walking in the gardens and admiring the art pieces he had acquired through the decades. He added to his personal journal—being painfully thorough, as it would not become a corporate record while he lived. Finally he prayed in the palace's small shrine, and took an ancient jewel-encrusted knife from the wall, sliding it under his belt.

He drove to the police headquarters and went to the detention area. Leaving three samurai on guard in the corridor, he entered Mme. Samario's cell accompanied only by Matsunaga.

The cell was tiny—a bed and a holovision entertainment unit were its only furnishings. Mme. Samario was held immobile in the bed by a restraining web. She wore a plain yellow jumpsuit. The bed contained medical monitors and equipment to provide food and water as well as remove wastes.

"I must speak with you, Valarie," he said.

She stared at him.

"I realize you have no pleasure in my company, so I will be as brief as possible." He gestured to Matsunaga, and the old samurai started to unhook the tubes and wires and webbing to free her from the bed. She watched suspiciously.

"Tomorrow you are scheduled for interrogation. There is nothing I can do to prevent that; my duty to the Nakai Corporation outweighs any personal considerations. Do you understand what will happen to you?"

More silence.

"The technique we use is a spinoff from our interstellar transmission technology. The electrical matrix of your brain will be read and all your memories recorded."

"You won't learn anything useful," she muttered. "I wasn't let in on any secrets, in case I was captured."

"That is of course a standard precau-

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MICHAEL REAVES

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they set the fragments to floating about each other
in the Abyss and supplied them with
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tion in such matters. But events don't occur in a vacuum; by subjecting your memories to computer analysis we will learn many details concerning your conspiracy. Unfortunately, as with the transmission process, the reading destroys the subject's brain. You will die."

Matsunaga helped her stand up. She pulled away from him and swayed on trembling legs, glaring at Lord Hiroshi like a trapped animal. "So you came to say goodbye to your daughter before killing her. How touching."

Lord Hiroshi's voice remained level. "I have come to pay a debt. I did you a terrible wrong; I see that now. I have explained my actions and my feelings to you. I can't undo the past, nor can I save your life. But I can grant you the fulfillment of your vengeance."

A pause, then, "What?"

Lord Hiroshi took the knife from his belt, and held it out to her. At the same time Matsunaga drew his sword and lifted it over his head.

"Take the knife," Lord Hiroshi said. "If you try to use it on yourself, Matsunaga will stop you before you can do so. But I have ordered him not to interfere if you use it on me. If you believe I owe you my life for the pain I caused you, I offer it to you."

Her eyes jumped back and forth between his face and the knife. "What kind of game are you playing with me?"

"The game of existence, which we all lose. But it is in the way we play that perhaps we lose better." He paused. "If you have no use for the knife, I will put it away."

She snatched it and held it in both hands. Her face was a bloodless mask. There were flecks of saliva on the corners of her mouth. She stared at the wickedly sharp, glistening blade. Her hands trembled.

He gently took her hands in his. "Here, my daughter," he said, and guided them so that the knife's point touched his kimono over his heart. "Do what you must."

She screamed and lunged. He felt a brief coldness in his chest, then nothing as the blessed night came.

He woke up in great amazement that he was still alive. The place where the knife had penetrated his body was numb; he felt very weak but otherwise sound. He opened his eyes, and was unsurprised to find himself in the bed of his palace's medical room. What did surprise him, even more than being alive, was the room's other occupant.

High Lord Nakai sat in a chair against the wall. Seeing that Lord Hiroshi was awake, he walked over to the side of the bed. He was smiling. "The doctors tell me it was touch and go there for awhile, but you will survive to die a better death."

Lord Hiroshi tried to get out of bed to show the High Lord proper respect, but he couldn't move. "I thank you for your presence, High Lord Nakai. I am shamed that I have taken you away from your duties at this critical time."

The High Lord shook his head. "Akagi, sometimes you give me a not inconsiderable pain. It is just the two of us here—talk to me."

"As you say." Lord Hiroshi managed a wan answering smile. "What about my . . . Mme. Samario?"

"She was interrogated three days

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ago, the day after your injury. Her body will be returned to the Commonwealth along with those of the terrorists. You may view it before then if you wish."

Lord Hiroshi felt nothing. Later, he knew, he would feel it keenly. But now the words were just words.

"I was curious why you sought such a unique form of suicide," the High Lord said thoughtfully, "so I did some research. I know the important facts concerning your daughter, and I sympathize."

"Thank you. But the doctors shouldn't have come between me and my karma."

"Did they, Akagi? She had the training to place that knife in your heart, but she missed. Why? Perhaps some part of her forgave you at the end."

Lord Hiroshi wanted desperately to believe that, yet how could he? "I caused her a lifetime of suffering, and I was willing to die for it."

"As the ancients used to say, bullshit."

"What?" Lord Hiroshi was too startled to take offense.

"You heard me. I am much too old and smart for a youngster like you to fool, even if you have managed to fool yourself. Your indiscretion which produced Mme. Samario was nothing more than that, willful and unwise but not evil. Your judgment was clouded by love—an unfortunate but inevitable human trait.

"You knew this in your soul, but your subconscious is cunning. It used the mask of guilt to disguise your attempt to escape from your actual fear."

Lord Hiroshi tried unsuccessfully to deny the anger that surged in him. "I don't understand."

"Yes, you do. You are deeply afraid of what you see as an inevitable war against the Commonwealth. And your role in that war."

He felt shame like cold piercing steel. "You . . . are right. I am a coward and a traitor."

"Because your subconscious tried to guide you to an honorable death instead? Nonsense. When the time came you would have done your duty, whatever the cost to you personally. Happily that won't be necessary."

"Pardon?"

"There isn't going to be a war."

Confusion fought against newborn hope. "What is the alternative?"

"A compromise, of course. I intend, after suitable preliminaries, to negotiate it directly with Premier Varga. In brief, the Commonwealth and we will jointly operate the satellites."

Lord Hiroshi was shocked into silence. The satellite proposal and the personal negotiation were both unprecedented, but the sort of bold strokes that High Lord Nakai was noted for. Finally he asked, "Can you convince the other Corporations to accept joint operation?"

"Yes, though it won't be done easily or quickly. But it must be done. While surrendering complete control of the satellites would be dangerous, war would be even more dangerous. *Uchu-giin* and *gaikoku* need each other. Our paternalism was justified while Earth was ruined and disorganized, a threat to its own survival as well as ours. But now the Commonwealth has proved to be a mature worldwide authority with which we can deal."

"How can we trust the Commonwealth? The terrorists—"

"Indeed, the terrorists. You jumped

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to an understandable but mistaken conclusion about them. I would like to think you missed the truth because you had something else on your mind. The clues were there; the resorting to force before negotiation had been tried, and the demand that the satellites be turned over to them rather than destroyed—the latter being a more likely possibility."

Lord Hiroshi reflected, and saw it at last. "The terrorists weren't sent by the Commonwealth."

The High Lord nodded. "They were sponsored by a dissident group within the Commonwealth government which planned to use the satellites to usurp power. The synthesis of Mme. Samario's pertinent memories and intelligence from other sources was very revealing. I have furnished a copy to the Commonwealth, and the dissidents are being arrested."

No war. No war. The words were a prayer of relief in his mind. Then he lay quietly as his thoughts darkened. At last he said, "I have been unworthy of the trust you put in me. I have failed the Nakai Corporation, and when I can leave this bed I will offer proper apology."

High Lord Nakai laughed. "And waste all my work preparing you to take my place in another few centuries? Oh no you don't. You did no worse than you should have under the circumstances. In fact you lack only one trait essential in a High Lord—self-forgiveness.

"But that will come. For now, rest and heal. When you are ready I want you to finish my inspection tour. A few decades of extra-solar travel should give you the opportunity to make peace with yourself. Sleep well, Akagi. We will talk again soon."

Lord Hiroshi watched through a mist of cleansing tears as High Lord Nakai turned and walked out of the room. ■

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Dr.
John Gribbin

THE LOST DIMENSIONS OF REALITY

The title may sound like old science fiction—but the content is very much new, serious science!

How many dimensions does our Universe occupy? Three spatial dimensions, of course, and I would expect any *Analog* reader to include time as the fourth dimension, making up Einstein's famous four-dimensional space-time continuum. But would you believe *eleven*? That is what a modern revival of an old theory requires—still just one dimension of time, but no less than ten dimensions of space, seven of which have got lost since the Big Bang in which the Universe was born. The theory, dubbed the Kaluza-Klein cosmology, started out as an esoteric mathematical artifact, a trick to provide a neat description of the Universe, but one which there seemed little hope of testing. But now it doesn't look so esoteric after all, and the latest—still somewhat speculative—developments on the theme suggest that just this kind of 11-dimensional reality might account for the outburst we call the Big Bang.

Theodor Kaluza was a Polish mathematician who was very much taken with Einstein's General Theory of Relativity. For a mathematician, the intriguing thing about this theory is that it abolishes the mysterious force of gravity, a hand reaching out across space to, for example, hold the Earth in its orbit around the Sun, and replaces it by geometry—curved spacetime. Einstein taught that the presence of a mass, such as the Sun, distorts the fabric of space-

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time so that the path of least resistance for a planet like the Earth—the four-dimensional equivalent of motion in a straight line—becomes an orbit around the central mass. The hoary old analogy (but no less effective for being old and hoary) is with an imaginary bowling ball placed on a strong, stretched rubber sheet. The ball makes a dent in the fabric, and if you try to roll a pool ball across the distorted rubber sheet in a straight line, it will actually be deflected into a curved trajectory. For those who worry about such things, the concept of objects moving always in the equivalent of straight lines—geodesics—through curved spacetime is much more satisfactory than a magical force that reaches out instantaneously through space to deflect a planet, or a pool ball, from its straight path.

The General Theory of Relativity was presented to the world in 1916. At that time, the only other force of nature that anyone knew about was the electromagnetic force, which itself incorporated the previous century's understanding of both electricity and magnetism into one theoretical framework. Einstein got rid of one force and explained gravity in terms of curved spacetime; Kaluza wondered whether he could get rid of electromagnetism in the same way. Six years after the General Theory of Relativity was published, Kaluza reported success. He was able to explain both gravity and electromagnetism, within the framework of one unified theory, in terms of bent spacetime. The only snag was, he had to invoke another dimension of space to accommodate the electromagnetic force. In this theory, an electromagnetic wave is a ripple in the fifth dimension.

The great strength of this theory was that by making the most natural mathematical extension of Einstein's four-dimensional theory to five dimensions, Kaluza immediately, without any tinkering with the equations, came up with the correct laws for both gravity and electromagnetism. The great weakness of the theory was that nobody had any evidence for the existence of a fourth dimension of space. But in 1926 a Swedish physicist, Oskar Klein, came up with at least a partial solution to the puzzle. The fifth dimension might exist, he said, but in some sense so "small" that its effects could not be distinguished in the everyday world.

This isn't as crazy as it sounds. There is a familiar theory of the Universe which says that it is, as a whole, closed, in the same way that the surface of a sphere, or the surface of the Earth, is closed. Travel far enough in one direction, and you get back to where you started. The distance you travel before getting back to where you started is the "size" of the dimension through which you have been traveling. If the size of the fifth dimension, in this sense, were extremely small, we wouldn't be able to observe it—except through its influence on the electromagnetic force. British cosmologist Paul Davies has made an analogy with a hosepipe. From a distance, it seems like a wriggly line; close up, we see that it is a cylinder, a skin surrounding a tube. Klein's idea was that each "point" of space (or

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spacetime) is really a little whorl, a loop around the fifth dimension. And in order for its effects to be unobservable, the size of the fifth dimension—the size of each whorl in space—would have to be no bigger than the size of a proton divided by a billion billion.

This was still less than perfect. After all, why should one of the five dimensions of reality be different from the others? As a mathematical abstraction, the Kaluza-Klein model survived and even received attention from theorists from time to time. But things began to change in 1980, when Alan Chodos and Steven Detweiler, of Yale University, provided a partial answer to that question. Building on work carried out in the 1950s by French physicist Jean-Marie Souriau, Chodos and Detweiler developed a mathematical framework in which all of the five dimensions, including time, had equal status long ago, but one of them has shrunk away to its present minute size as the Universe has evolved. This was a definite step forward—but meanwhile the physicists had come up with a few more forces of nature to worry about.

Today, in addition to gravity and the electromagnetic force, we recognize two forces that affect the behavior of elementary particles on a scale of atomic nuclei; these are called the strong and weak nuclear forces. The way these forces behave is more complicated than electromagnetism. If you think of the photon as the "messenger" that "carries" the electromagnetic force, the weak force requires three different messengers. The Z^0 and the W^+ and W^- particles were recently discovered, just as theory had predicted, in experiments at CERN, the European center for particle physics near Geneva in Switzerland. The strong force is worse still. It requires no less than eight messengers, called gluons. And if you try to put that lot into a modified Kaluza-Klein theory, you come up with a mathematical description in which all of the forces of nature can, indeed, be represented, like gravity, in terms of curved space. The only snag is, you need 10 dimensions of space (plus one of time) to do the trick.

It sounds crazy. But ponder on this. When someone came up to the pioneering quantum physicist Niels Bohr with a new theory in the late 1920s, he responded "Your theory is crazy, but it's not crazy enough to be true." Could the new version of the Kaluza-Klein theory be crazy enough to be true? Let's look a little deeper into the implications.

Michael Duff and Chris Pope, at Imperial College in London, have extended the idea of a little circle in space, a whorl representing the fifth dimension, to the seven extra dimensions needed by the new theory. There are lots of ways of wrapping up seven dimensions together, but the simplest possibility is the seven-dimensional analogy of the sphere, which is called (logically enough) a seven sphere (in the same terminology, a circle is a two sphere). Just as a three-dimensional sphere is the most symmetrical structure in the everyday world, a seven sphere is the most symmetrical structure in seven dimensional space. And symmetries are the

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key to the present day understanding of the world of particle physics. Today, physicists believe that once, early in the Big Bang, all of the forces of nature (strong, weak, gravity and electromagnetism) had an equal status. They were equally strong and perfectly symmetrical. The symmetries were broken as the Universe expanded and evolved, and what we see today are the results of symmetry breaking. And this symmetry breaking can be exactly represented by squashing a Kaluza-Klein seven sphere.

Still with me? Over the past few years, physicists have been taking the Kaluza-Klein theory more seriously than ever before. They have discovered, quite independently, that a totally unrelated approach to the problem of unifying all the forces of nature in one theory (called supersymmetry), naturally requires a mathematical formulation in 11 dimensions. There is a speculation that an 11-dimensional spacetime might represent a state of lowest energy for the Universe. Nature always seeks out a state of minimum energy, and it seems more than a coincidence that two quite different attempts to unify the forces of nature both lead to 11 dimensional theories. So, even before the speculation is confirmed, other theorists are racing ahead to come up with ideas on why and how seven of these 11 dimensions should have got lost en route from the Big Bang to the present day.

A typical stab at the kind of problems that might be solved by the new approach has been made by William Marciano, of the Brookhaven National Laboratory. He says that there is no reason why the Kaluza-Klein radius of a particular lost dimension should only contract. Each dimension may contract, or expand, or oscillate, as time goes by, and we just happen to have three expanding dimensions today. But these lost dimensions are responsible for the everyday forces of nature, including gravity. If the appropriate radius were to oscillate, then the value of the constant of gravity would change, and that might be detectable as an influence in the three- (or four-) dimensional world.

Even better is a possibility which Marciano himself describes as a "far-out speculation." The most fundamental feature of our Universe is that it is expanding, that the three space dimensions we perceive are growing (and, indeed, that time is passing). It could be that this is a *result* of the other seven dimensions' rolling themselves up into a seven sphere and radiating energy into our three dimensions. The Big Bang itself might be a multi-dimensional Kaluza-Klein phenomenon. Detection of a change in the constant of gravity, or in some fundamental property such as the ratio of the mass of the proton to the mass of the electron, might provide physicists with a window on the lost dimensions of reality, and a clue to the origin of the Universe itself.

If you want to have your mind expanded by more ideas like these, John Gribbin's latest books are Spacewarps *(Delta) and* In Search of Schrödinger's Cat: Quantum Physics and Reality *(Bantam).* ■

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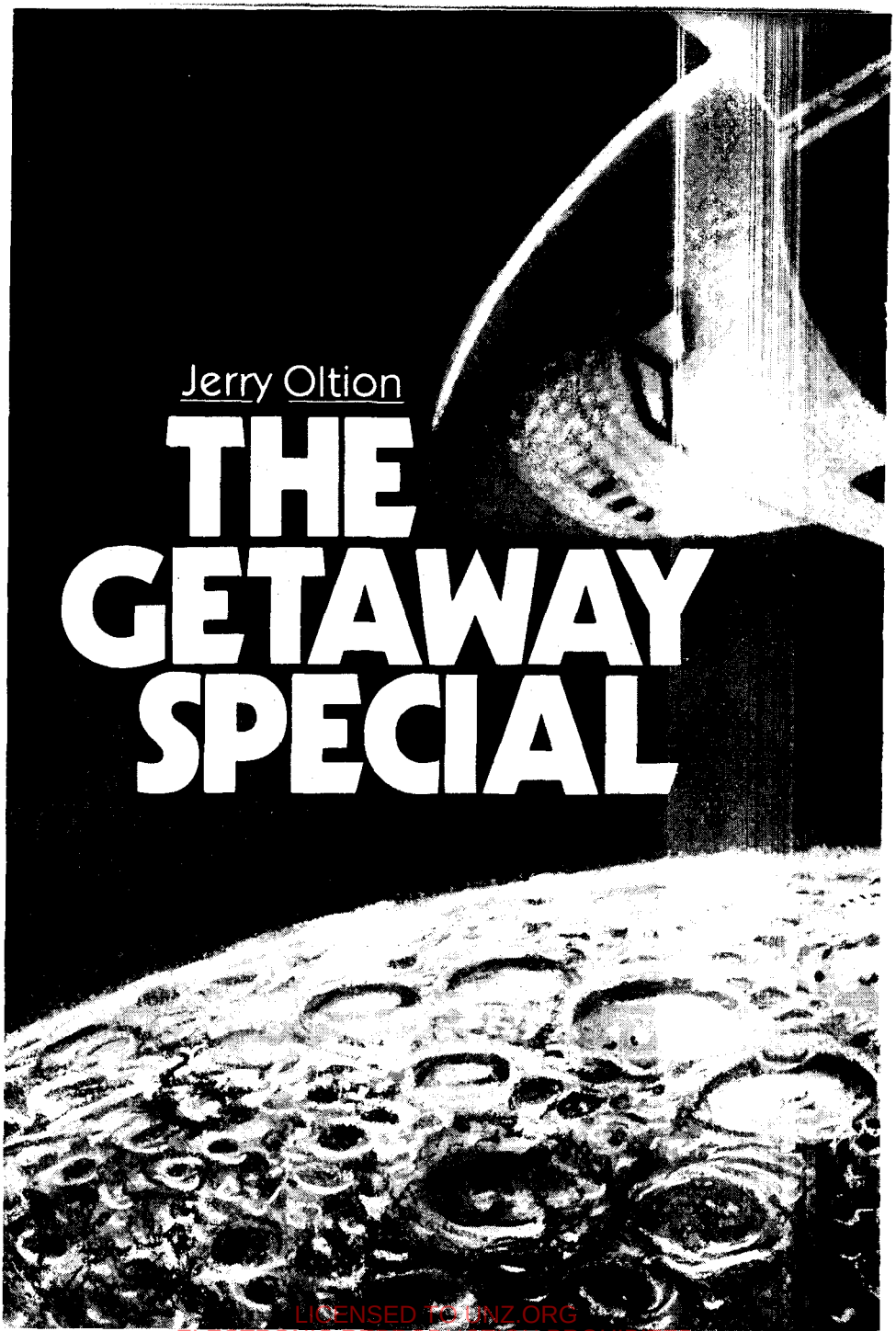

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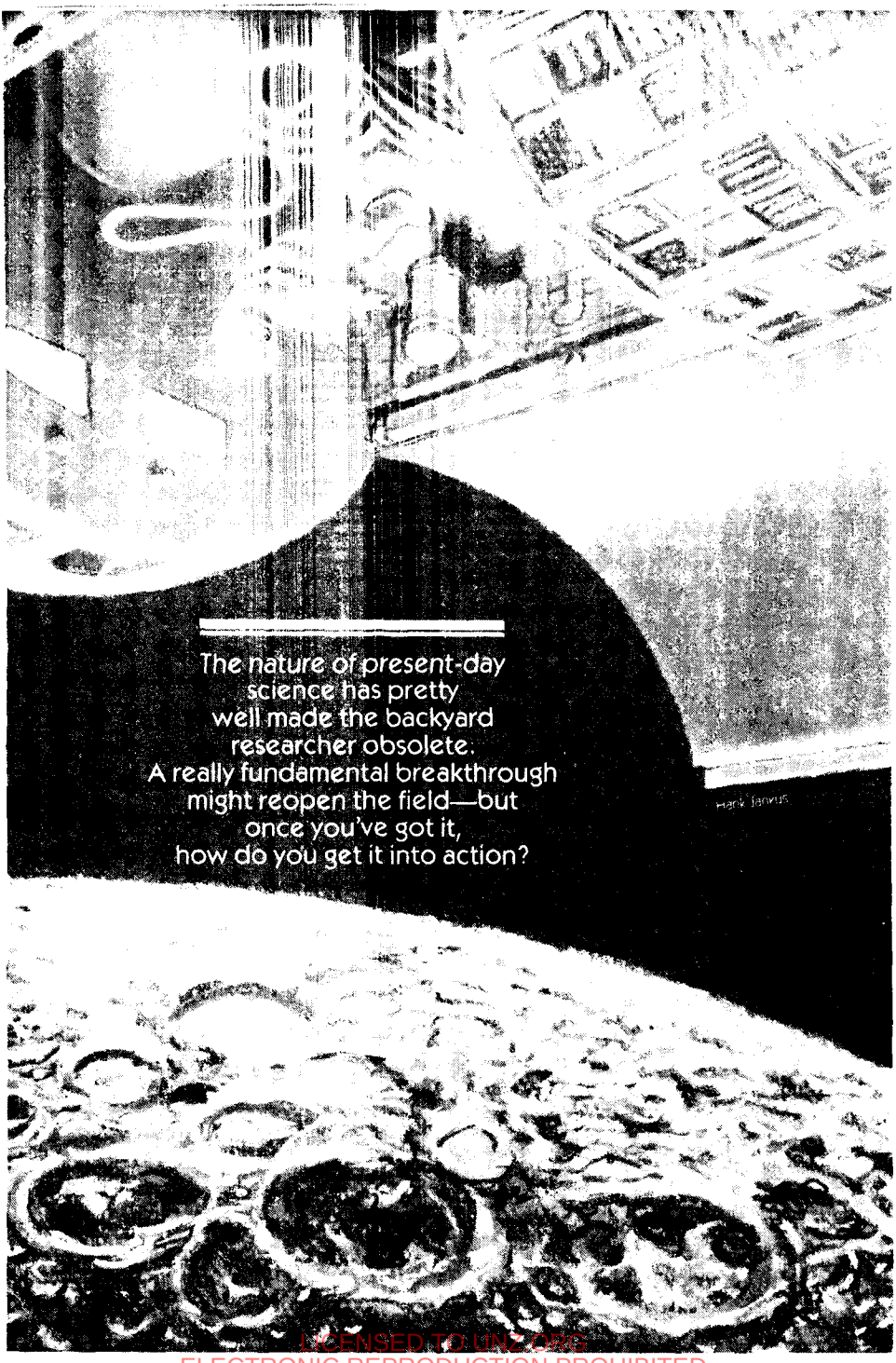

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Allen Meisner didn't look like a mad scientist. He not only didn't look mad, with his blonde hair neatly brushed to the side and his face set in a perpetual grin, but—at least in Judy Gallagher's opinion—he didn't look much like a scientist, either. He looked more like a beach bum.

But his business card read: "Allen T. Meisner, Mad Scientist," and he had the obligatory doctorate in physics to go with it. He also had a reputation as an outspoken member of INSANE, the politically active International Network of Scientists Against Nuclear Extermination, and he held patents on half a dozen futuristic gadgets, including the still-experimental positronic battery. He had all the qualifications, but he just didn't look the part.

That was all right with Judy. In her five years of flying the shuttle, most of the passengers she had taken up *had* looked like scientists, or worse: politicians. She enjoyed having a beach bum around for a change.

Right up to the time when he turned on his experiment and the Earth disappeared. She didn't enjoy that at all.

It started out as a routine satellite deployment and industrial retrieval mission, with two communications satellites going out to geostationary orbit and a month's supply of processed pharmaceuticals, optical fibers, and microcircuits coming back to Earth from the Manned Orbiting Laboratory. It was about as simple as a flight got, which was why NASA had sent a passenger along. Judy and the other two crewmembers would have time to look after him, and NASA could reduce by one more the backlog of civilians who had paid for trips into orbit.

Another reason they had sent him was the small size of his experiment. Since the shuttles had begun carrying payloads both ways there wasn't a whole lot of room for experiments, which meant that most scientists had to wait for a spacelab mission before they could go up. But Meisner had promised to fit everything he needed into a pair of getaway special cannisters if NASA would send him on the next available flight. After all the bad publicity they'd gotten for carrying the laser antisatellite weapons into orbit, they'd been glad to do it. It would give the press something else to talk about for a while.

They had even stretched the rules a little in their effort to launch a scientific mission. Most getaway specials were allowed only a simple on/off switch, or at most two switches, but they had allowed Meisner an alphanumeric keypad and a small liquid crystal display for his. It had seemed like a reasonable request at the time. After all, he would be there to run it himself; none of the crewmembers needed to fool with it.

Officially his was a "Spacetime Anomaly Transfer Application Experiment." One of the two cannisters was simply a high-powered radio transceiver, but the other was a mystery. It contained a bank of positronic batteries with enough combined power to run the entire shuttle for a month, plus enough circuitry to build a mainframe computer, all hooked to a single prototype integrated circuit chip the size of a deck of cards. That in turn was connected to a spherically-radiating antenna mounted on top of the cannister. Rumor had it

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that someone in the vast structure of NASA's bureaucracy knew what it was supposed to do, but no one admitted to being that person. Still, it apparently held nothing that could interfere with the shuttle's operating systems, so they let it on board. It was Meisner's problem if it didn't work.

So on the second day of the flight, as mission specialist Carl Reinhardt finished inspecting the last of the return packages in the cargo bay with the camera in the remote manipulator arm, he said to Meisner, "Why don't you go ahead and warm up your experiment? I'm about done here, and you're next on the agenda."

Discovery, like all of the shuttles, had ten windows: six wrapping all the way around the flight controls in front, two facing back into the cargo bay, and two more overhead when you were looking out the back. Meisner was blocking the view out the overheads; he'd been watching over Judy's shoulders while she used the aft reaction controls to edge the shuttle slowly away from the orbital laboratory and into its normal flight attitude. He nodded to Reinhardt and pushed himself over to the payload controls, a distance of only a few feet. In the cramped quarters of the shuttle's flight deck nearly everything was within easy reach. It was possible—if you floated with your feet in-between the pilot's and copilot's chairs and your head pointed toward the aft windows—to strand yourself without a handhold, but to manage it you had to be trying. Meisner had put himself in that position once earlier in the flight, and he'd gotten the worst case of five-second agoraphobia that Judy had ever seen before she could rescue him. After that he kept a handhold within easy reach all the time.

Judy finished maneuvering the shuttle into its parking orbit and watched the shadows in the cargo bay for a few more seconds to make sure that the shuttle was stable. She checked Reinhardt's progress as he latched down the manipulator arm, glanced upward through the overhead windows at the Earth, then turned to watch Meisner.

Here, in her opinion, was where the action was on this flight. For years NASA had promoted the image of the shuttle as a space truck, and that's what it had become, but for Judy the lure of space was in science, not industry. She wanted to explore, not drive a truck. But she was twenty years too late for Apollo, and by the looks of things at least twenty years too early for the planetary missions. Driving a space truck that occasionally did science projects was the best she could hope for.

She was looking over Meisner's shoulder now. His keypad took up a corner of one of the interchangeable panels that had been installed for controlling yesterday's satellite launches. Beside it was a simple toggle switch, which he flipped on. He looked at the display for a moment, then pushed a button labeled "Transmit/Time." The radio gave a loud beep, and the top line of the display began counting forward in seconds.

As he tapped instructions into the keyboard Judy saw a series of numbers flash on the display. They were in groups of three, but she could see no particular meaning to them.

"What are those numbers?" she asked.

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"Coordinates," Meisner replied.

"Coordinates for what?"

Meisner smiled and pushed the *enter* button. "Us," he said.

Reinhardt, who was still looking out the aft windows into the payload bay, shouted something like "Whaaa!" and leaped for the attitude controls.

Judy's flinch launched her headfirst into the instrument panel in front of her. She swore and pushed herself over beside Reinhardt. "What happened?"

He pointed through the overhead windows, but it took Judy a second to realize what he was pointing at, or rather what wasn't where he was pointing. In normal flight the shuttle flew upside down over the Earth, making for an excellent view of the planet overhead, but now there were only stars where it should have been. She pushed off to the front windows and looked to either side, but it wasn't there either.

Meisner said, "Don't worry, it's—"

"Not now," Judy cut him off. First thing in an emergency: shut the passengers up so you can think. Now, what had happened? She had a suspicion. Meisner's experiment had blown up. It had to have. She pulled herself up to the aft windows to get a look down into the cargo bay where the getaway special cannisters were attached, next to the forward bulkhead. She couldn't see that close in, but there was no evidence of an explosion, nothing that could have jolted the shuttle enough to flip it over. Besides, she realized, nothing had. They would have felt the motion. The Earth had simply disappeared.

A long list of emergency procedures reeled through her mind. Fire control, blowout, toxic gases, medical emergencies—none of them applied here. There was nothing in the book about the Earth disappearing. But there was always one standing order that never changed. *In any emergency, communicate with the ground.*

"Don't use the jets," she said to Reinhardt, then, turning to the audio terminal she flipped it to transmit and said, "Control, this is *Discovery*, do you copy?"

Meisner cleared his throat and said, "I don't think you'll be able to raise them."

Judy shot him a look that shut him up and called again. "Control, this is *Discovery*. We've got a problem. Do you copy?"

After a couple of seconds she switched to another frequency and tried again, but still got no response. She was at the end of her checklist. What now?

Meisner had been trying to say something all along. She turned around to face him and said, "All right. What did you do?"

"I—ah, I moved us a little bit. Don't worry! It worked beautifully."

"You moved us. How?"

"Hyperdrive."

There was a moment of silence before Judy burst out laughing. She couldn't help it. *Hyperdrive?* But her laughter faded as the truth of the situation started to hit her.

Hyperdrive?

Behind her, Reinhardt began to moan.

As calmly as she could, Judy said, "Put us back."

Meisner looked hurt. He hadn't expected her to laugh. "I'm afraid I can't just yet," he said.

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"Why not? You brought us here, wherever here is."

"We're somewhere between the orbits of Earth and Mars, and out of the plane of the ecliptic, but we could be off by as much as a few light-seconds from the distance I set. We shouldn't try to go near a planet until I take some distance measurements and calibrate—"

"Whoa! Slow down a minute. We're between Earth and Mars?" She felt a thrill rush through her as she asked the question. Could they really be? This was the sort of thing she had always dreamed of. Captain Gallagher of the Imperial Space Navy! Hopping from planet to planet at her merest whim, leading humanity outward from its cradle toward its ultimate destiny in space . . .

But right behind it came the thought, *I'm not in command of my ship.*

Meisner said, "If my initial calculations were correct we are. We'll know in a minute."

"How?"

"I sent a timing signal before we jumped. When it catches up with us I'll know exactly how far we moved. It should be coming in any time now."

Judy looked toward the radio speaker. It remained silent. Meisner began to look puzzled, then worried. He turned back to the keypad and began pushing buttons again.

"Stop!"

He looked up, surprised.

"Get away from there. Reinhardt, get between him and that panel."

Reinhardt nodded and pulled himself over beside Meisner.

"I'm just checking on the coordinates," Meisner said. "I must have miskeyed them."

After a moment's thought, Judy said, "Okay, go ahead, but explain what you're doing as you go along. And don't even *think* of moving the ship again without my permission." She nodded to Reinhardt, who backed away again, then she suddenly had a thought. "Christ, go wake up Gerry. He'd shoot us if we didn't get him in on this too."

A minute later Gerry Vaughn, the copilot, shot up through the hatch from the mid-deck and grabbed the back of the command chair to slow down. He looked out the forward windows, then floated closer and looked overhead, then down. He turned and kicked off toward the aft windows, looked around in every direction, and finally backed away. Then, very quietly, he said, "Son of a bitch."

Meisner beamed.

"Where are we?"

He lost some of his smile. "I'm not sure," he admitted. "We're supposed to be two and a half light-minutes from Earth in the direction of Vega, but we either missed the signal or went too far."

"Signal?"

"Before we jumped, I transmitted a coded pulse. When the pulse catches up we'll know our distance. Next time we jump I'll send another pulse, and as long as we jump beyond the first one then we can triangulate our position when they arrive. That way I can calculate the aiming error as well as the distance error."

"Oh," Vaughn said. He looked out the windows again as if to assure himself that the Earth was really gone. Finally he said, "Look at the sun."

"What?"

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"The sun."

Judy looked. It was shining in through the forward windows. She had to squint to keep it from burning her eyes, but not much, and now she could see what Vaughn was talking about. The solar disk was about a fourth the normal size.

Reinhardt had looked too. He made a strangling sound, looked over at Judy as if he was pleading for help, then his eyes rolled up and he went slack.

"Catch him!" Judy yelled, but it was hardly necessary. People don't fall when they faint in free-fall.

Neither do they faint. Blood doesn't rush away from the brain without gravity to pull it. So what had happened to him?

As she debated what to do, the answer came in a long, shuddering breath. "Oh," she said. "He forgot to breathe." She laughed, but it came out wrong and she cut it off. She wasn't far from Reinhardt's condition herself.

Get it under control, she thought.

"Vaughn, help him down to his bunk."

When they had gone below, she said, "Well, Meisner, this is a pretty situation you've got yourself in."

"What do you mean?" he asked.

"I mean hijacking and piracy."

"What? You've got to be—" He stopped. She wasn't kidding. "All right, I can believe hijacking, but piracy?"

"We're carrying a full load of privately-owned cargo, which you diverted without authority. That makes it piracy. You should have thought of that before you started pushing buttons."

Meisner looked at her without comprehension. "I don't get it," he said. "What's wrong with you people? I demonstrate a working hyperdrive engine and Reinhardt curls up into a ball, and now you start talking about piracy? Where's your sense of adventure? Don't you realize what this means? I've given us the key to the entire universe! We're not stuck on one planet anymore! I've ended the threat of nuclear extermination forever!"

Judy hadn't even thought of that angle. She'd been too busy trying to supress the hysterical giggles that kept threatening to bubble to the surface. Hyperdrive! But now she did think about it, and she didn't like what she came up with. "Ended the threat of nuclear extermination? You idiot! You've probably caused it! Do you have any idea what's going on at Mission Control right now? Full scale panic, that's what. They've just lost an orbiter, gone, just like that, and it's not going to take long before somebody decides that the Soviets shot us down with an antisatellite weapon. I think you're smart enough to figure out what happens then."

She watched him think it through. He opened his mouth to speak, but he couldn't.

Judy said it for him: "We've got to get back within radio range and let them know we're okay, or all sorts of hell is going to break loose. So how do we do that?"

"I—without calibrating it we shouldn't—"

"I just want you to reverse the direction. Send us back the same distance we came. Can you do that?"

"Uh . . . yes, I suppose so. The error in distance should be the same both ways. But I don't think it's a good idea. We could be off in direction as well as

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distance. We could wind up in the wrong orbit, or underground for that matter."

Judy tried to weigh the chances of that against the chances of nuclear war. Since the Soviet Union had put missiles in Cuba again in response to American missiles in Europe, both sides were on a launch-on-warning status. If somebody decided they had already used their A-sat weapon . . . ?

She was starting to feel like a captain again. At least she felt the pressure of being the one in command. Four lives against five billion, hardly a choice except that she had to make it. She heard herself say, "It's a chance we'll have to take. Do it."

Seconds later she was convulsed in laughter. It was an involuntary reaction. The giggles had won.

Meisner stared at her for a moment before he ventured, "Are you all right?"

Judy fought for control, and eventually found it. She wiped fat globules of tears away from her eyes and sniffed. "Yeah," she said. "It just hit me." She pitched her voice in heroic tones and said, " 'I'll take that chance, Scotty! Give me warp speed!' God, if only the *Enterprise* had flown."

Meisner looked puzzled for a second before comprehension lit up his face. "The first shuttle. Okay." He laughed quietly and turned to his keypad. As he punched in the coordinates he said, "You know, I did try to buy the *Enterprise* for this, but I couldn't come up with the cash."

"I'm surprised you didn't build your own ship out of an old septic tank or something. Isn't that the way most mad scientists do it?"

"Don't laugh; I could have done it that way. But I didn't think a flying septic tank was the image I wanted. I thought a shuttle would be better for getting the world's attention."

"Well you definitely did that. I just hope we can patch things back together before it's too late. Are you ready there?"

"Ready."

"Let's go then."

Meisner grinned. "Warp speed, Captain," he said, and pushed the button.

Earth suddenly filled the view again. It was at the wrong angle, but just having it there again made Judy sigh in relief. She tried the radio again.

"Control, this is *Discovery*. Do you copy?"

Response came immediately. "*Discovery*, this is Control. We copy. What is your status, over?"

"Green bird. Everything is fine. We've had a minor, uh, navigational problem, but we've got that taken care of. No cause for alarm. What is *your* status, over?" She realized she was babbling. There would be hell to pay when she got back on the ground, but she didn't care. Warp speed!

The ground controller wasn't much better off. "Everything is under control here too," he said. "Barely. What is the nature of your navigational problem? Over."

She suddenly realized that she had another big choice to make. Half the world must be listening in on her transmission; should she tell them the truth? Or should she do the military thing and keep it a secret? There were code words for just such a contingency as this.

It was a simple decision, even simpler

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than the one to return. She said, "Dr. Meisner has just demonstrated what he calls a hyperdrive engine. I believe his description of it to be accurate. We went—"

There was a violent lurch, followed by the beep of Meisner's radio pulse, and the Earth disappeared again.

"Damn it, I told you not to touch that until I gave the word! Get away from there!"

Meisner looked hurt. "I think I just saved our lives," he said. "Somebody shot at us." He pointed out the aft windows into the cargo bay, where a cherry-red stump still glowed where the vertical stabilizer had been. Hydraulic fluid bubbled out into vacuum from the severed lines.

Judy took it all in in less than a second, then whirled and kicked herself forward between the commander's and the pilot's chairs to look at the fuel pressure gauges. They remained steady, but the hydraulics and the auxiliary power units that drove them were both losing pressure fast. It hardly mattered, though; both systems were used only during launch and descent, and there could be no descent without a vertical stabilizer.

She shut off the alarms and clung to the command chair for support. "That was stupid," she said. "Of course the A-sat weapons would fire on something that suddenly pops into orbit where it doesn't belong. Damn it! Now there really is going to be a war." She turned around to face Meisner. "Take us back again, but this time put us short of the Earth. I don't want to go into orbit; I just want to be in radio range."

Meisner hesitated. "I—I don't think we should—"

"Do it! The end of the world is about fifteen minutes away. I don't care what it takes, just get us within radio range. And *outside* laser range."

Meisner nodded.

While he punched numbers on his keypad, Judy tried to compose what she was going to say. She wouldn't report the damage yet, not until she was sure everybody had their fingers off of the missile launch buttons. Ground control would know by their telemetry that something was wrong, but they wouldn't know how it happened, and the military would know that the Soviets had fired an A-sat weapon, but they wouldn't know at what. Or—she had a sudden thought. Who said it had to be a Soviet A-sat? It had to have been an automatic shot; that made it an even chance that it was an American beam.

It hardly mattered. Either way, it would mean war if she didn't explain what had happened.

Meisner looked over at her and said, "I've cut the radial distance by one percent. I don't know where that will put us, but it should at least be out of Earth orbit."

Judy nodded. "Okay. Do it." She turned to the radio.

The stars changed, but the Earth didn't fill the view. In fact it took Judy a moment to find it: a gibbous blob of white reminiscent of Venus seen through a cheap telescope. At least she supposed that was Earth. A bright point of light that might have shown a disk if she squinted had to be the Moon beside it. They were too close together, though, or so she thought until she remembered that the Moon could be between the ship and Earth, or on the other side of it, and

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the apparent distance would be shorter than it really was.

She shook her head. "Too far," she said. "We'd never make ourselves heard from this distance. You'll have to take us closer."

Meisner was starting to sweat. "Look," he said. "I can't keep moving us around without calibrating this thing. Every time we jump we're compounding our error, and we get farther and farther from knowing where we are."

"I know exactly where we are," Judy said. "We're too far for radio communications. Take us closer." She waited about two seconds while Meisner hesitated, then added, "Now."

"All right," he said. He tried to throw his hands up in a shrug, but he overbalanced and had to grab onto the overhead panel to steady himself. He pulled himself down again and began to work with the keyboard.

Judy heard the radio pulse and the view changed again. Earth was larger, about the size that it would be when seen from the Moon. She didn't see the Moon out the front windows, but when she looked back through the cargo bay windows she found it. It was bigger than the Earth. Much bigger. They couldn't have been more than a couple thousand miles from it. She watched the surface for a few seconds, trying to determine their relative motion. Was it getting closer? She couldn't tell.

All the same, as she plugged her headset into the radio she said, "Get ready to move us again." This time Meisner didn't argue.

"Control, this is *Discovery*, do you copy?"

She had forgotten about the time lag. She was about to call again when she heard, "Roger *Discovery*, we copy, but your signal is weak and you have disappeared from our radar. What's happening up there?"

"We're not in orbit any longer. Doctor Meisner's experiment has moved us to the general vicinity of the Moon. I repeat, Doctor Meisner's experiment is responsible for our change in position. There is no cause for alarm. Do you copy?"

A pause. "We copy, *Discovery*. No cause for alarm. You bet. We'll tell the guys at NORAD and SAC to get their fingers off the buttons, then. Hold on a second—uh . . . we've just gotten word from the Pentagon that we're not to mention the nature of Doctor Meisner's experiment, over."

"Don't tell the world that we've got hyperdrive? You know where you can tell them to put it, control. Kindly remind the idiots at the Pentagon that I am a civilian pilot, and that my loyalty goes to humanity first, nation second. What they request is tantamount to suppressing knowledge of the wheel, so you can tell the Pentagon to stuff it deep, over."

Judy saw motion out of the corner of her eye and turned to see Meisner applauding silently. He said, "I have a—"

Judy held up her hand to quiet him as mission control responded. She could hear the cheering in the background. "Roger, *Discovery*. We copy and agree. Your, ah, hyperspace jump seems to have messed with the telemetry. We're getting low pressure readings in the hydraulics and APU's. Do you confirm, over?"

"Your readings are correct. We have

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sustained damage to the vertical stabilizer. We won't be able to re-enter. Request you reserve space for us on the next flight down."

"Roger, *Discovery*. What kind of damage to the stabilizer?"

"It's been vaporized. Completely melted away. We assume it was either a particle beam or laser antisatellite weapon, automatically fired. We do not consider ourselves to have been attacked. Please be sure the Pentagon understands, over."

"Roger, *Discovery*. I'm sure they'll be glad to hear that."

Meisner butted in. "Uh, Commander?"

"I'll bet they will. Hold on a sec." She turned off the mike. "What, Allen?"

"I think we should get away from here. We're picking up velocity being this close to the Moon. It'll make it hard to put us back into orbit."

"Velocity? How?"

"Gravitation. We're falling toward the Moon. When we make our next hyperspace jump the velocity we gain will still be with us. We'll have to cancel it before we can go into Earth orbit."

"Oh. Right." Judy tried to visualize the situation in her mind. Too close to the Moon; well, "Can you put us on the other side of the Earth?"

"I don't want to fool around near the planets any more. I need to calibrate it. I think the danger of war is past, is it not?"

Judy nodded. "Okay. Give me a minute to explain what we're going to do, then you can take us wherever you want. Within reason," she amended quickly. She turned on the radio again and said, "Control, this is *Discovery*. Doctor Meisner says that the Moon's gravitation is causing us to build up unwanted velocity. We will have to make another hyperspace jump in order to leave the area, plus another series of jumps to calibrate the engine. We will be out of radio contact for a while. Promise you won't let them blow up the world while we're gone? Over."

"We'll do our best, *Discovery*. Things are a little hot down here."

"Just keep the lid on until we get back. Remind the President that this would be a really stupid time to go to war."

"We'll do that. Good luck, *Discovery*."

"Good luck to you. *Discovery* out." Judy switched off the radio, turned around, and screamed.

"Be calm," Vaughn said as he floated up through the hole between decks with the .45 from the emergency survival kit in his hand. "You may continue with your jump, Allen. Judy, you will please come away from the controls.

"What do you think you're doing?" she demanded.

"I am appropriating this vessel for the Soviet Union. You will not be harmed so long as you do as I say."

"Come off it, Gerry. You're not going to fire that thing in here. One stray shot and you'd lose all your air."

"There is that risk. I'd have preferred a less destructive weapon, but the survival kit doesn't carry a dart gun. I'll just have to be careful not to miss, won't I? Now come away. Slowly, that's it." He reached out and stopped her in midair, leaving her floating where he could see her move long before she reached

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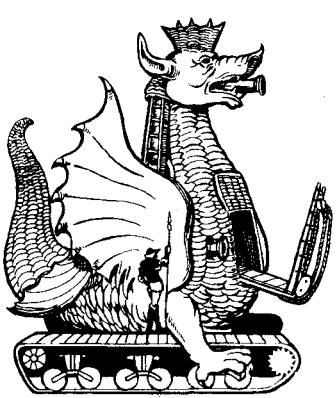

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anything to push off against.

Vaughn glanced out the aft windows at the surface of the Moon and said, "Allen, you may move us any time now." The gun didn't quite point at him.

Meisner swallowed. "Right," he said. He turned to the keyboard and began keying in coordinates.

"Why are you doing this, Vaughn?" Judy asked. "You're not a Russian."

"That depends on your definition. I have been a sleeper agent since before I entered the space program. In any case, my nationality is not the issue. What matters is my belief that the Soviet Union should have this device."

Meisner cleared his throat. "I, uh, I was planning on giving it to everybody. You see, part of the reason I did things the way I did was to get everybody to listen, so I could transmit the plans by radio to the whole world."

Vaughn shook his head. "A noble thought. Unfortunately, the world is not ready for it. The Soviet Union must keep this idea secret until the rest of humanity is sufficiently civilized to handle something this dangerous."

"Bullshit," Judy said. "You can't believe—"

Vaughn waved the pistol toward her. "Be quiet. Allen, you will make the jump now."

Meisner turned back to his keyboard and pushed the button that sent the timing pulse, then after a few seconds pushed the transmit button.

Nothing happened.

"What—?" He looked out the window, pushed it again, and looked again. Still nothing changed.

"I must have mis-keyed it," he said. He entered the coordinates again, canceled the timer and reset it, and hit "transmit" again.

Still nothing.

"Something's wrong."

"Meisner." Vaughn did have the gun pointed at him now.

"I'm not lying! It's not working! It's hardly surprising, with all the jumps we've been doing in a row. Something's probably overheated. It's still an experimental model, you know."

"Then you will find the problem and fix it." Vaughn glanced out the window and added, "I suggest you do it quickly."

Judy followed his glance. The surface was definitely closer now.

Meisner said, "You'll have to go out and get the cannister."

"Not until you've exhausted the possibilities inside. The problem may be in the keyboard."

"It isn't. The signal is reaching the radio, and all the data uses one line. The problem is in the cannister."

Vaughn thought it through and nodded. "All right, but Judy will go out and get it. I prefer to remain here where I can watch you."

The Moon was larger still by the time Judy stepped out into the cargo bay. She had cut the suiting-up time to its bare minimum, but it still took time breathing pure oxygen to wash the nitrogen out of her bloodstream, and even Vaughn with his pistol couldn't force her to go outside before she was sure she was safe from the bends. Once she was out she took time for one quick look—she could see their motion now—then unfastened the "mystery" cannister and climbed back into the airlock with it under her

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arm. When she got back inside she handed it to Meisner and started to pull off her helmet.

"Leave it on," Vaughn said. Judy could hear the tension in his voice even through the intercom. She understood the reason for it, and for his order. She wouldn't have time to become uncomfortable in the suit. If Meisner found the problem she would have to take the cannister back outside, and if he didn't they would crash into the Moon; either way she wouldn't have to worry about the suit for very long.

Meisner floated over to the wall of lockers in the mid-deck and opened the tool locker. Then he opened the cannister and held it so the light shined down inside. It was a maze of wires and circuit boards. He looked for a minute, then reached in and pushed a few wires around. He let go of the cannister and left it floating in front of him, looked up and said, "I think I've found it. Judy, could you help hold this a minute?"

She nodded and pushed off toward him.

"Here, around on this side," he said, pulling her around so he was between her and Vaughn. Reinhardt was still unconscious in his bunk beside them; evidently Vaughn had given him a sleeping pill when he had the chance. Meisner let himself drift forward far enough to make sure he was blocking Reinhardt too, handed the cannister to Judy, then pulled a screwdriver out of the tool kit. He reached into the cannister's open end with it, then looked at Vaughn.

"I've just taken over the ship," he said. "Gerry, float that gun over here, very gently."

Vaughn didn't look amused. "What are you talking about? Get busy and fix that before I—"

"Before you what? I give you ten seconds to surrender or I take this screwdriver and stir. Shoot me before I make the repairs and you get the same result. Maybe they'll name the crater after you."

Vaughn shifted the gun to point at Judy, and Meisner shifted his head to be the target again. "Won't work. You can't risk hitting me and you know it. Float the gun over. Five seconds." Meisner slowly threaded the screwdriver in between the wires until his hand was inside the cannister, saying all the while, "Four seconds, three seconds, two seconds, one—very good, Gerry. Judy, catch that."

She let go of the cannister and fielded the gun, holding it in between her gloved hands. She felt a moment of panic. "I can't get my finger in the trigger guard!"

"Trade me." Meisner let go of the cannister and took the gun from her, then said, "Get in the bottom bunk, Gerry."

Wordlessly, Vaughn drifted over and slid into the bunk, and Meisner closed the panel after him. He hunted in the tool kit until he found a coil of what looked like bell wire and used that to tie the panel shut, then gave the gun back to Judy and took the cannister. He began looking inside it again, poking and prodding around.

"What are you doing?" Judy asked.

"Looking for the problem."

"I thought you said you'd found it."

"I lied. I didn't figure there was

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much point in looking until we had Gerry safely out of the way."

"But what if—never mind. Just hurry. We don't have much time."

"It won't take long. If it isn't something simple I won't be able to fix it anyway. I don't have any test equipment. All I brought along were spare parts."

Judy propped herself against the lockers, her back against the wall and her feet out at an angle against the floor. She'd discovered the position on her first flight. It almost felt like gravity, at least to the legs, and it had the added advantage of holding her in place. She said, "I can't believe you. Do you have the slightest idea what this means to the human race?"

"I think I do, yes."

"Then why are you risking it like this? You should have made it public the moment you realized what you had. Good god, if the secret dies with us now, we—"

"It won't. I arranged a mailing to every member of INSANE the day before we launched. The plans should be arriving in the mail today, all over the world." Meisner raised his voice, though the intercoms made it unnecessary. "There are thirty-seven Russians in INSANE, Gerry. They each got the packet too. So you see, none of this really would have made much difference in the long run anyway. This was just a public demonstration so they wouldn't waste time trying to decide if it would really work. And I still intend to make a radio broadcast of the plans from orbit when we get back. I don't think any elite group should have a monopoly on space travel, not even INSANE." He paused, squinted inside the cannister, and said, "I think I've found it. The heat blistered a ROM chip."

He opened his personal locker and got out a baggie full of electronics parts. He fished around until he found the one he needed, a black caterpillar of an I.C. chip about an inch long, and replaced the one in the cannister with it. He put the lid back on and held it out. "Okay, you can put it back now."

Judy took the cannister and pushed herself toward the airlock. Before she closed the door, she said, "Why don't I stay out there while you try it? It'll save time if we have to bring it in again."

"Good idea."

She closed the airlock door and began depressurizing it. It seemed to take forever to bleed the air out, but she knew that it only took three minutes. She could hear her own breathing inside her helmet, just the way she'd imagined she would when she was a little girl dreaming about space. The suit stiffened a little as the outside pressure dropped. When the gauge reached zero she opened the outer hatch and stepped out into the cargo bay.

The Moon was a flat gray wall of craters in front of her. She watched it for a moment, thinking, *This is what it looked like to the Apollo crews. And I thought I'd never get to see it.*

What sorts of other things would she be seeing that she had only dreamed of before? The other planets, almost certainly. Other stars? Why not? She knew she was going to be in trouble when she got back, but Meisner's invention practically assured her that the trouble wouldn't last. Space-trained pilots were

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going to be in very short supply before long. NASA couldn't afford to ground her now, but even if they did she knew she could get a job flying somebody else's ship. Or even her own, for that matter. She wasn't above flying a converted septic tank, if that's what it took to stay in space.

Judy heard a nervous voice over the intercom. "Having problems out there?"

She shook herself back to the present. The Moon was growing closer by the second. "No. Hang on." She fastened the getaway special cannister back to the cargo bay wall and plugged in the data link to the ship. "How's that?"

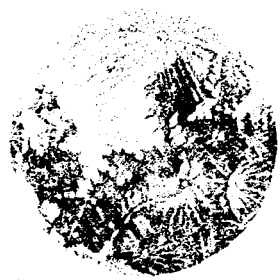
"I'm getting power. Let me run the diagnostic check." A few seconds later, Meisner said, "Looks good. I'm keying in the coordinates."

"You sure you don't want to stay and admire the view?"

"Uh . . . some other time, maybe."

"Right." Judy reached out to steady herself against the airlock door. She looked up for one last look at the Moon, so near she almost felt she could touch it. Some day she would. Some day soon. She cleared her throat. "Whenever you're—"

But it had already disappeared. ■



● If your question is whether we will think of the teachers of the future as we have thought of the doctors and lawyers of the past, my answer, regrettably, to that is that I doubt it. But if your question is whether we are going to begin to understand that teachers are the people that we have picked to pass on what we know and what we think is important to the next generation, and are we going to acknowledge them as a vital, very large—two million people—cog in our social enterprise, then yes, I think and hope we will do that.

P. Michael Timpane, President, Teachers College of Columbia University

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Jay Kay Klein's biolog

Lacking any known *Analog* writer born in Antarctica, one must suppose that Jerry B. Oltion is the writer born and raised in the least populated area of the world: Story, Wyoming, population 400. He has since moved to Cody, not far from Yellowstone National Park and sporting well over 5,000 inhabitants. Jerry is sure his upbringing influenced his choice of profession, since he spent his childhood daydreaming stories in the surrounding

Jerry Oltion

woods cradled in the Bighorn Mountains. To anyone asking the inevitable silly question of where he gets his ideas, he will reply "from the future."

Typically for an *Analog* author he has read science fiction almost from the moment he could read at all, and he wanted to write it nearly as soon. It has been contended by many writers that in order to do science fiction well, one must start early—on one hand to have "authenticity" and on the other to avoid re-inventing some outworn clichés.

A determined writer for nearly four years now, Jerry has also worked at an assortment of part-time jobs, including rock-and-roll deejay, garbage truck driver, surveyor, printer, stone mason, carpenter, and Forest Service trail crewman. Driving the garbage truck was the most fun, actually, though a new teaching job at the local Computerland store looks promising. He was self-taught on his own word processor.

His first *Analog* story "Much Ado about Nothing" and its sequel "The Sense of Discovery" in the November 1982 and March 1983 issues were set in the Bighorn Mountains. He owns the record, I would think, for the shortest story ever to appear in the magazine: two words. "Oltion's Complete, Unabridged History of the Universe" appears on page 113 of the June, 1983 issue.

An outdoorsman, Jerry backpacks when he's not slaving over a hot computer or reading as much science fiction as he can get. The nearest science fiction bookstore is 100 miles away in Billings, Montana. Living in such a remote location and yet loving technology does not seem strange to him. He feels that higher technology is making it easier to live in out-of-the-way, beautiful places. He makes it clear that, given the choice between living in the past and living in the future, the age of running water and flush toilets takes first place every time. Types who yearn for outdoor plumbing and gaslights mystify him.

Jerry has a B.A. in English Literature from the University of Wyoming, but spent most of his time in the physics and astronomy departments. He's a member of the L-5 Society, and likes to think that, though technology won't automatically solve all our problems, it will give us a wider choice of solutions. That includes the option to construct colonies in space where we can live—not in small enclosures with a few houseplants, but within large enclosures and surrounded by whole, manicured forests. His vision of the future is a technological arcadia. ■

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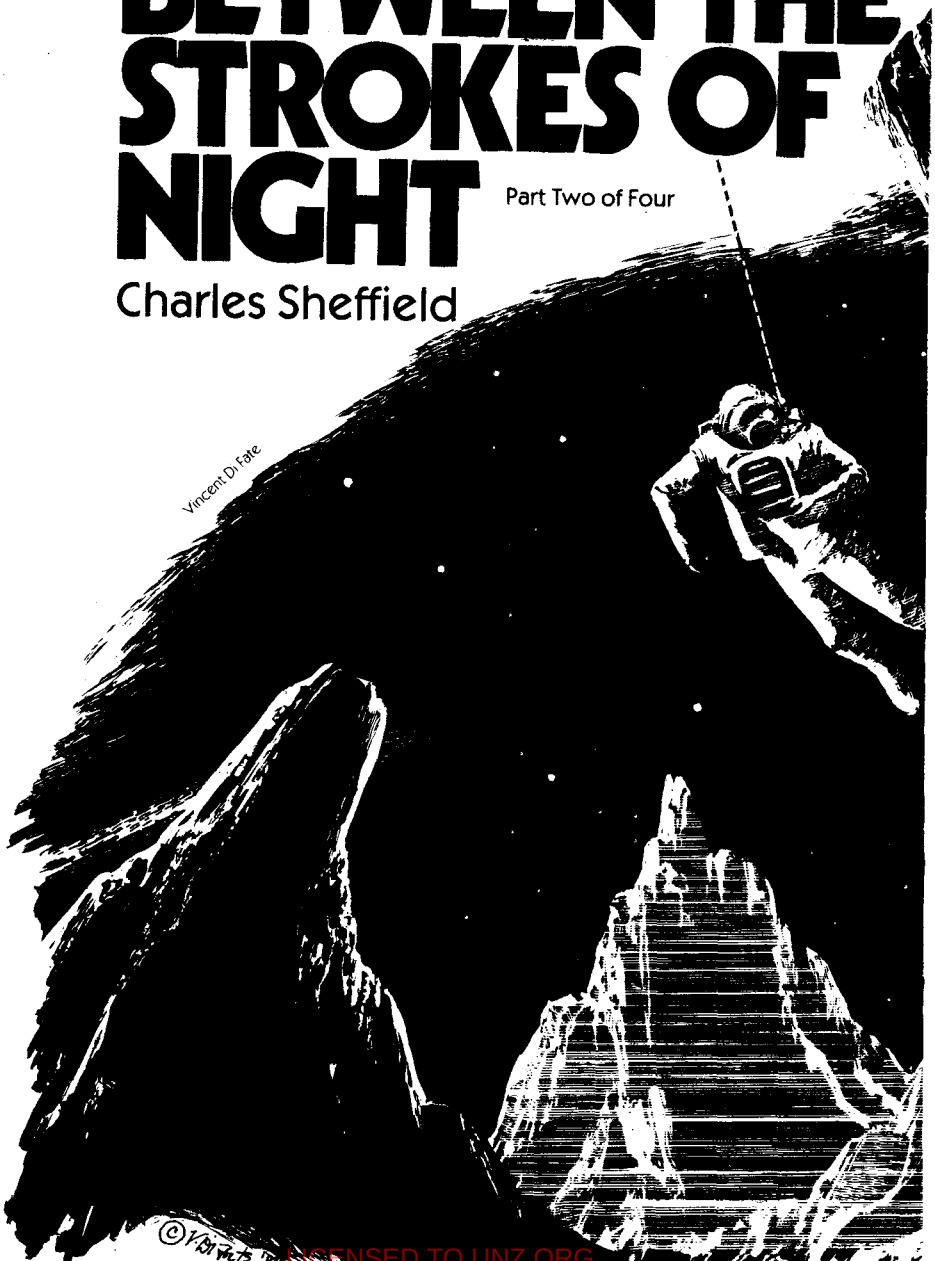
BETWEEN THE STROKES OF NIGHT

Part Two of Four

Charles Sheffield



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Even the workers on a research project of really far-reaching importance may have very little idea where it will eventually lead

SYNOPSIS

It is 2,010 A.D. In the Neurological Institute in Christchurch, New Zealand, **Charlene Bloom** *and her assistant,* **Wolfgang Gibbs,** *have been conducting hibernation experiments on Kodiak bears. Their objectives: an understanding of the nature of sleep, and a reduction in human need for sleep. During the experiment one bear, Dolly, dies when her body temperature is taken down near to freezing and her pulse rate is slowed to a few beats a minute. By reversing the procedures, they manage to save Dolly's partner, a male Kodiak bear named Jinx.*

Charlene Bloom has the unpleasant task of explaining what has happened to Dolly to the Institute Director, **Judith Niles,** *who has been working for many years to reduce human sleep needs to zero. Bloom explains about Dolly's death, and notes that before Dolly died her condition had apparently stabilized for a while, with brain waves exhibiting their usual profiles—but fifty times slower than usual. Judith Niles is very interested in this result, and wants to explore it in detail. However, she is distracted by two other factors: there are big cuts threatened in the Institute's budget, and she is expecting an important visitor.*

That visitor is **Hans Gibbs** *(a cousin of Wolfgang), who has come down from the orbital facility known as* **Salter Station** *to seek help from Judith Niles and the staff of the Neurological Institute.*

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Deteriorating political conditions among the nations of Earth made Hans Gibbs's trip a difficult one, but he finally arrives. At the Institute he shows Judith Niles a videotape of an astronaut who suffered narcolepsy (sudden and uncontrollable sleep) while wearing a space suit. He explains that the problem has become a common one, and tells her of an offer from his boss, **Salter Wherry.** *The offer is for guaranteed increased funding for the Institute—if they will relocate to Salter Station and work there to solve the narcolepsy problem.*

Judith Niles is tempted, because she is experiencing funding difficulties, and also because some of her experiments depend crucially on a low-gravity environment. But she is worried, because Salter Wherry, in addition to his reputation as the man who developed space industry and self-sufficient colony ships in space, is also known as a master manipulator of other people. After discussion with **Jan de Vries,** *a close advisor, Judith Niles decides to go up to Salter Station and take a look at the situation there for herself.*

Arriving at Salter Station, Niles is very impressed with the facility and the colony ships; but she tells Hans Gibbs that she will agree to nothing unless she is granted a personal meeting with Salter Wherry. He is a recluse, who has refused meetings with strangers for years. However, to Hans Gibbs's surprise he agrees to meet with Judith Niles.

Wherry proves to be very old and frail, and has already survived several serious heart attacks. He explains to Judith Niles that he does not have much time left, and he wants an instant *solution to the narcolepsy problem. It is slowing construction work on the arcologies, and he wants to see them finished. He makes it clear that although he is hiring the whole Institute, it is Judith Niles in particular whom he wants to work on the problem. As an added incentive, he points out that she will have opportunity to perform experiments on Salter Station that she is unlikely to get permission for back on Earth.*

Judith Niles is tempted, even though she strongly suspects that Wherry has some hidden agenda of his own. She also believes that she already has the answer to the narcolepsy problem, and upon her return to Earth she performs an experiment to test her idea. With Wolfgang Gibbs as a volunteer in a space suit from Salter Station, they take the air pressure in a chamber down close to zero and ask Wolfgang to perform simple manual tasks using the TV camera in the suit to provide him with an image. Gibbs loses consciousness. Later, Niles explains to Jan de Vries what happened. Small and recent design changes in the suits produce pressure on the wearer's neck in certain positions, compressing the carotid arteries. That causes a momentary blackout. However, feedback through the TV scan system is at such a rate as to continue that blackout and cause continued narcolepsy.

Judith Niles tells de Vries of her dissatisfaction with the explanation: it is too simple. *Salter Wherry's own scientists should have found the solution for themselves, and this makes her suspicious. But while they are talking Judith Niles has problems of her own: she*

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begins to suffer from blurring and double vision in her left eye. Jan de Vries urges her to have a thorough medical examination, and adds another factor for her consideration. Hans Gibbs had mentioned that insurance rates for space work have increased because of the narcolepsy—but now de Vries finds that the insurance company concerned is controlled by Salter Wherry. They both suspect that Wherry is working to manipulate them for his own purposes, though neither of them can think of a logical reason for it. Eventually, Judith Niles makes the decision that the Institute should move up to Salter Station.

Meanwhile, Salter Wherry has been reviewing the international situation back on Earth, where climatic changes have caused crop failures and increasing political instability and unrest. He sees new evidence of major changes to come, and he is alarmed enough to tell Hans Gibbs that operations must be speeded up. The Neurological Institute must move to space as soon as possible, and the arcology completion schedule must be advanced.

Wolfgang Gibbs is the first Institute staff member to move up to orbit. He travels with the experimental animals, and once he is settled in he takes the Kodiak bear, Jinx, into a new hibernated condition. Again there is low temperature and slow pulse, but this time he manages to stabilize Jinx completely. The bear remains fully conscious even though its metabolic rate is down by a factor of eighty. Wolfgang is excited by the result of the experiment, but other factors reduce his pleasure: Judith Niles has now had the medical tests that de Vries suggested, and they indicate a bad problem; and back on Earth, the international situation is still deteriorating rapidly. War and threats of war are everywhere.

In their new feuding, the governments of Earth seem ready to block all travel —including access to space itself.

Chapter 10: The End of the World

Hans Gibbs had sent his cousin the briefest, uninformative message from the main control room. "Get your ass over here. On the double,or you'll miss something you'll never see again."

Wolfgang and Charlene were in the middle of first inventory when that message came over the intercom. He looked at her and signed off the terminal at once. "Come on."

"What, right now?" Charlene shook her head in protest. "We're just getting started. I promised Cameron we'd have this place organized and ready to go to work when they got here. We only have a few more hours."

"I know. But I know Hans, too. He always understates. It must be something special. Let's go, we'll finish this later."

He took her hand and began to pull her along, showing off his hard-won experience with low g. Charlene had been on Salter Station less than twenty-four hours, the second person to make full transfer from the Institute. It seemed grossly unfair to Wolfgang that she hadn't suffered even one moment of freefall sickness. But at least she didn't have his facility yet for easy movement. He tugged her and spun her, adjusting linear and angular momentum. After a few moments Charlene realized that she should move as little as possible, and

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let him drag her along as a fixed-geometry dead weight. They glided rapidly along the helical corridor that led to the central control area.

Hans was waiting for them when they arrived, his attention on a display screen showing Earth at screen center. The image was being provided from a geostationary observing satellite, 22,000 miles up, so the whole globe showed as a ball that filled most of the screen.

"You won't see anything ship-sized from this distance," Hans said. "So we have to fake it. If we want to see spacecraft, the computer generates the graphics for them and merges it all into the display. Watch, now. I'm taking us into that mode. The action will start in a couple of minutes."

Charlene and Wolfgang stood behind him as Hans casually keyed in a short command sequence, then leaned back in his chair. The display screen remained quiet, showing Europe, Asia, and Africa as a half-lit disc under medium cloud cover. The seconds stretched on for what seemed like forever.

"Well?" said Wolfgang at last. "We're here. Where's the action?"

He leaned forward. As he did so, the display changed. Suddenly, from six different points on the hemisphere, tiny sparks of red light appeared. First it was half a dozen of them, easy to track. But within a few minutes there were more, rising like fireflies out of the hazy globe beneath. Each one began the slow tilt to the east that showed they were heading for orbit. Soon they were almost too numerous to count.

"See the one on the left?" said Hans. "That's from Aussieport. Most of your staff will be on that: Judith, and de Vries, and Cannon. They'll be here in an hour and a half."

"Holy hell." Charlene was frowning, shaking her head. "Those *can't* be ships. There aren't that many in the whole world."

She was too absorbed by the scene in front of her to catch Hans Gibbs's familiar reference to the Institute Director, but Wolfgang had given his cousin a quick and knowing look.

"Charlene's right," said Hans. He looked satisfied at her startled reaction. "If you only consider the Shuttles and other reuseables, there aren't that many ships. But I ran out of time. Salter Wherry told me to get everything up here, people and supplies, and to hell with the cost. He's the boss, and it was his money. The way things have been going, if I'd waited any longer we'd never have been allowed to bring up what we need. What you're seeing now is the biggest outflow of people and equipment you'll ever see. I took launch options on every expendable launch vehicle I could find, anywhere in the world. Watch now, there's more to come."

A second wave had begun, this time showing as fiery orange. At the same time, other flashing red points were creeping round the Earth's dark rim. Launches made from the invisible hemisphere were coming into view.

Hans touched another key, and a set of flashing green points appeared on the display, these in higher orbit.

"Those are our stations, everything in the Wherry Empire except the arcologies—they're too far out to show at this scale. In another half-hour you'll see how most of the launches begin to

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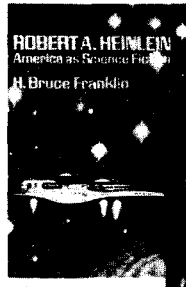

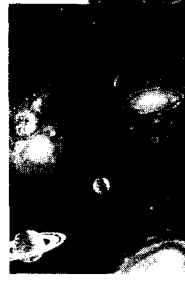

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converge on the stations. We'll be faced with multiple rendezvous and docking up here, continuously for the next thirty-six hours."

"But how do you know where the ships are?" Charlene was wide-eyed, hypnotized by the swirl of bright sparks. "Is it all calculated from lift-off data?"

"Better than that." Hans jerked a thumb at another of the screens, off to the side. "Our reconnaissance satellites track everything that's launched, all the time. Thermal infrared signals for the launch phase, synthetic aperture radar after that. Software converts range and range-rate data to position, and plots it on the display. Wherry put in the observation and tracking system a few years ago, when he was afraid some madman down on Earth might try a sneak attack on one of his Stations. But it's ideal for this use."

A third wave was beginning. All around the equator, a new necklace of dazzling blue specks was expanding away from the Earth's surface. The planet was girdled by a multi-colored confusion of spiraling points of light.

"For God's sake." Wolfgang dropped any pretence of nonchalance. "Just how many of these *are* there? I've counted over forty, and I've not even been trying to track the ones launched in the American hemisphere."

"Two hundred and six spacecraft, all shapes and sizes, and most of them not designed for the sort of docking ports we have available here. The count for launches shows on that readout over there." Hans waved a hand at a display, but his attention was all on the screen.

"It's going to be a nightmare," he said cheerfully. "We have to match them all up when they get here. Matter of fact, we won't even try to bring all of them all the way. Lots of 'em will stay in low orbit, and we'll send the tugs down to transfer cargo. I didn't have time to worry about extra thrust to bring them up here. We had enough trouble getting some of that junk into orbit at all."

A fourth wave had begun. But now the screen was too confusing to follow. The points of light were converging, and the limited resolution of the display screen made many appear close to collision, even though miles of space separated them. The two men seemed hypnotized, staring at the bright carousel of orbiting ships. Charlene went to the viewport and looked directly down toward Earth. There was nothing to be seen. The ships were far too small to show against the giant crescent of the planet. She shook her head, and turned to face the launch count readout. The total was ticking higher, skipping ahead in little bursts as orbital velocity was confirmed for the ships in a new group.

Hans had moved back from the control console, and the three stood side by side, motionless. The room remained totally silent for several minutes except for the soft beep of the counters.

"Nearly there," said Charlene at last. She was still watching the ship count. "Two hundred and three. Four. Five. One more to go. There. Two hundred and six. Should we be applauding?"

She smiled at Wolfgang, who absentmindedly squeezed her hand. Then she casually turned back to the counter. She stared at it for a few seconds, suddenly not sure what she was seeing.

"Hey! Hans, I thought you said the

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total was two hundred and six? The readout shows two hundred and fourteen now, and it's still going."

"What!" Hans swiveled his head to look, the rest of his body turning the other way to give low-g compensation for the movement. "It can't be. I scrounged every ship that would fly. There's no way . . ."

His voice faded. On the screen, a fountain of bright points of light was spouting upward. It centered on an area of southeast Asia. As they watched, a speaker by the console stuttered and burst to life.

"Hans! Full alert." The voice was harsh and strained, but Wolfgang recognized the note of authority. It was Salter Wherry. "Bring up our defense systems. Monitors show launch of missiles from west China. No trajectory information yet. Could be headed for America or the Soviet Union; some could be coming our way. Too soon to tell. I've thrown the switch here. You confirm action stations. I'll be in central control in one minute."

In spite of its tone of agonized strain, the voice had made its staccato statements so fast that the sentences ran into one stream of orders. Hans Gibbs did not even attempt a reply. He was off his seat and over to another console instantly. A plastic seal was removed and the lever behind it pulled out before Wolfgang or Charlene could move.

"What's happening?" cried Charlene.

"Don't know." Hans sounded as though he were choking. "But look at the screen—and the count. Those have to be missile launches. We can't afford to take a chance on where they're heading."

The readout was going insane, digits flickering too fast to read. The launch count was up over four hundred. As it escalated higher, Salter Wherry came stumbling into the control room.

It was his arrival, in person, that made Charlene aware of the real seriousness of the situation. Here was a man who rarely met with anyone, who prized his privacy above any wealth, who hated exposure to strangers. And he was there in the control room, oblivious to the presence of Charlene and Wolfgang.

She stared at him curiously. Was this the living legend, the master architect of Solar System development? She knew he was very old. But he looked more than old. His face was white and haggard, like a stretched-out death mask, and his thin hands were trembling.

"The fools," he said softly. His voice was a croaking whisper. "Oh, the fools, the damned, damned, *damned* fools. I've been afraid of this, but I didn't really believe it would ever happen in my lifetime. Do you have our defenses up?"

"In position," said Hans harshly. "We're protected. But what about the ships that are on their way here? They'll be blown apart if they're on a rendezvous trajectory with us."

Charlene stared at him mindlessly for a second. Then she understood. "The ships? My God, the whole Institute staff are on their way up here. You can't use your missile defense on them—you can't do it!"

Wherry glared at her, seeming to notice the strangers in the control room for the first time. "Even the fastest of our

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ships won't be here for an hour," he said.

He sank to a chair, his breath wheezing in his throat. He coughed and leaned back. His skin looked dry and white, like crumbling doug. "By then it will all be over, one way or another. The attack missiles have high accelerations. If they're aimed at us, they'll be here in twenty minutes. If they're not, it will be over anyway. Hans, flag our position on the display."

Under Hans Gibbs's keyboard control, the position of Salter Station appeared on the screen as a glowing white circle. Hans studied the whole display for a few moments, head cocked to one side.

"I don't think they're coming this way," he said. "They're heading for the eastern Soviet Union and the United States, for a guess. What's happening?"

Wherry was sitting, head down. "See what you can catch on radio communications." He cleared his throat, the breath wheezing in his larynx. "We've always been worried that somebody would try a sneak first strike, wipe out the others' retaliatory power. That's what we're seeing. Some madman took advantage of the high level of our launch activity—so much going on, it would take anyone a while to realize an attack was being made."

Hans had cut in a radio frequency scan. "Radio silence from China. Look at the screen. Those will be United States' missiles. The counterattack. We knew a pre-emptive first strike wouldn't work, and it didn't."

A dense cluster of points of fire was sweeping up over the North Pole. At the same time, a new starburst was rising from eastern Siberia. The launch readout had gone insane, emitting a series of high-pitched squeaks as individual launches became too frequent to be marked as a separate beep from the counter. Over two thousand missile launches had been recorded in less than three minutes.

"Couldn't work. Couldn't work," said Salter Wherry softly. "First strike never would—it always leaves something to hit back."

His head slumped down. For the first time, Charlene had the thought that she might be seeing something more than old age and worry. "Wolfgang! Give me a hand."

She moved to Wherry's side and placed her hand under his chin, lifting his head. His eyes were bleary, as though some translucent film covered them. At her touch he feebly raised his right hand to grip hers. It was icy cold, and his other hand clutched at his chest.

"Couldn't work. Couldn't." The voice was a rough whisper. "It's the end, end of the world, end of everything."

"He's having a heart attack." Charlene leaned over to lift him, but Wolfgang was there before her.

"Hans. You could do this better than we can, but you'd better stay there—we have to know what's going on. Alert the medical facility, tell them we think it's a heart attack. Ask them if we should move him, or if they want to treat him here—and if they want him at the facility, tell me how to get him there."

Charlene helped to lift Wherry from the seat. She did it as gently as she could, while some part of her brain stood back astonished and watched

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Next time you see a tree, say thanks.
Thanks for books and pencils and paper, thanks for wood to build our homes and firewood to keep us cozy in them, thanks for violins and cellos and guitars, thanks for furniture and paints and paintbrushes, thanks for maple syrup and sleds, thanks for park benches and gymnasium floors, thanks for fruits and jams and jellies, thanks for shade for a Sunday afternoon nap, and a special thanks for the oxygen we breathe. Trees give us a lot. Don't take them for granted. Please be careful with fire in the forest. A tree will thank you.
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Wolfgang and Hans. There had been a strange and sudden change in their relationship in the past few minutes. Hans was still older, more senior, and more experienced. But as events became more confused and depressing, he seemed to dwindle, while Wolfgang just became more forceful and determined. At the moment there was no question as to who was in control. Hans was following Wolfgang's orders without hesitation. He was at the console, ear mike on, and his fingers were flying across the array of keys.

"Leave Wherry here," he said after a few seconds. "Med Center says Olivia Ferranti will be right over. Lay him flat, then don't move him, don't try any treatment unless he stops breathing —they'll bring portable resuscitation equipment with them."

"Right." Wolfgang gestured to Charlene, and between them they carefully lowered Salter Wherry to the floor, supporting his head on Wolfgang's jacket. He lay quiet for a moment, then made an effort to lift himself.

"Don't move," said Charlene.

There was a tiny sideways movement of his head. "Displays." Wherry's voice was a rustling whisper. "Have to see the displays. Reconnaissance. Cities."

Hans had turned to watch them. He nodded. "I've already asked for that. Major cities. What else?"

"Can you reach the ship with the Institute senior staff on board?" asked Wolfgang. "We have to talk to J.N. They're well clear of the atmosphere, but I don't know if they're line-of-sight from here."

"Doesn't matter." Hans turned back to the console. "We can go through relays. I'll try to reach them. We'll have to use another channel for that. I'll feed them in to the screen behind you."

He set to work at the keyboard. He was the only one with enough to occupy him completely. Charlene and Wolfgang stood by feeling helpless. Salter Wherry, after his effort to raise his head, lay motionless. He looked drained of all blood, with livid face and hands bent into withered claws. His breath gargled deep in his throat, the only sound that broke the urgent beep of new launches. The sparks were no longer concentrated in a band around the Earth's equator. Now they covered the globe like a bright net, drawn tighter in the northern hemisphere and over the pole.

Olivia Ferranti arrived just as the reconnaissance satellite images appeared on the screen. The doctor took one startled look at the blue-white blossoming explosion that had been Moscow, then ignored it and knelt beside her patient. Her assistant rapidly connected electrodes from the portable unit to Salter Wherry's bared chest, and took an ominous-looking saw and scalpel from a sterilized carrying case.

"Transmissions from the ship you want coming in," said Hans. "Whom do you want?"

"J.N.," said Wolfgang. "Charlene, you'd better talk to her. Tell them not to move away from a rendezvous trajectory until our missile defense goes off here. They'll be safe anywhere—"

His words were lost in a huge burst of noise from the communications units.

"Damnation." Hans Gibbs rapidly reduced the volume to a tolerable level. "I was afraid of that. Some of the ther-

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monuclear explosions are at the edge of the atmosphere. We're getting ElectroMagnetic Pulse effects, and that's wiping out the signals. We're safe enough, all the Wherry system was hardened long ago. I'm not sure about that ship. I'm going to try a laser channel, hope they're hardened against EMP, and hope we're line-of-sight at the moment."

The reconnaissance screens told a chilling story. Every few seconds the detailed display shifted to show a new explosion. There was no time to identify each city before it vanished forever in the glow of hydrogen fusion. Only the day or night conditions of the image told the watchers in which hemisphere the missiles were arriving. It was impossible to estimate the damage or the loss of life before a new scene was crowding onto the screens. Salter Wherry was right, the hope of a pre-emptive first strike had proved an empty one.

Wolfgang and Charlene stood together in front of the biggest screen. It still showed the view from geostationary orbit. Again the display was sparking with bright flickers of light, but this time they were not the result of computer simulation. They were explosions, multiple warhead, multi-megaton. The whole hemisphere was riddled with dark pocks of cloud, as buildings, bridges, roads, houses, plants, animals, and human beings were vaporized and carried high into the stratosphere.

"Hamburg." Wolfgang whispered the word, almost to himself. "See, that was Hamburg. My sister was there. Husband and kids, too."

Charlene did not speak. She squeezed his hand, much harder than she realized. The explosions went on and on, in a ghastly silence of display that almost seemed worse than any noise. Did she wish the screen showed an image of North America? Or would she rather not know what had happened there? With all her relatives in Chicago and Washington, there seemed no hope for any of them.

She turned around. On the floor, a mask had been placed over the lower part of Salter Wherry's face. Ferranti had opened Wherry's dark shirt, and was doing something to his chest that Charlene preferred not to look at too closely. The assistant was preparing a light-wheeled trolley to carry a human.

Dead, or alive? Charlene was shocked to see that Wherry was fully conscious, and that his eyes were swiveling to follow each of the displays. There was an intensity to his expression that could have been heart stimulants, but at least that dreadful glazed and filmy look was gone.

Charlene followed Wherry's look to the screen at the back of the room. A fuzzy image was building there, with a distorting pattern of green herringbone noise overlaid upon it. As the picture steadied and cleared, she realized that she was looking at Jan de Vries. He was sitting in a Shuttle seat, a pile of papers on his lap. He looked thoroughly nauseated. And he was crying.

"Dr. de Vries—Jan." Charlene didn't know if he could hear her or see her, but she had to cry out to him. "Don't try to rendezvous. We're operating a missile defense system here."

He jerked upright at her voice. "Charlene? I can hear you, but our vi-

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sion system's not working. Can you see me?"

"Yes." As soon as she said the word, Charlene regretted it. Jan de Vries was dishevelled, there was a smear of vomit along his coat, and his eyes were red with weeping. For a man who was so careful to be well-groomed always, his present condition must be humiliating. "Jan, did you hear what I said?" she hurried on. "Don't let them try to rendezvous."

"We know." De Vries rubbed at his eyes with his fingers. "That message came in before anything else. We're in a holding orbit until we're sure it's safe to approach Salter Station."

"Jan, did you see any of it? It's terrible, the world is exploding."

"I know." De Vries spoke clearly, almost absently. Somehow Charlene had the impression that his mind was elsewhere.

"I have to talk to a doctor on Salter Station," he went on. "I would have done it before launch, but there was just too much confusion. Can you find me one?"

"There's one here—Salter Wherry had a heart attack, and she's looking after him."

"Well, will you bring the doctor to the communicator? It is imperative that I talk with her about the medical facilities on Salter Station. There is an urgent need for certain drugs and surgical equipment—" Jan de Vries suddenly paused, looked perplexed, and shook his head. "I'm sorry, Charlene. I hear you, but I am having difficulty in concentrating on more than one thing just now. You said that Wherry had a heart attack. When?"

"When the war started."

"A bad attack?"

"I think so. I don't know." Charlene couldn't answer that question, not with Salter Wherry gazing mutely at her. "Dr. Ferranti, do you have time to talk for a few moments with Dr. de Vries?"

The other woman looked up at her coldly from her position by Wherry. "No. I've got my hands more than full here. But tell me the question, and I'll see if I can give you a quick answer."

"Thank you," said de Vries humbly. "I'll be brief. Back on Earth there are—or were—four hospitals equipped to perform complete parietal resection, with partial removal and internal stitching of the anterior commissure. It needs special tools and a complicated pre- and post-operative drug protocol. I would like to know if such an operation could be performed with the medical facilities available at Salter Station's Med Center."

"What the hell is he going on about?" asked Hans in a gruff whisper over his shoulder to Wolfgang. "The world's going up in flames, and he's playing shop talk about hospitals."

Wolfgang gestured to Hans to keep quiet. Jan de Vries had stated many times that he was unencumbered in the world, an orphan with no living relatives, and no close friends. His griefs should not be for lost family or loved ones. But Wolfgang could see the look on de Vries's face, and something there spoke of personal tragedy more than any general Armageddon. A strange suspicion whispered into Wolfgang's mind.

Dr. Ferranti finally turned her head to stare at de Vries' image. "We don't have the equipment. And seeing that—"

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she jerked her head at the main display —"I guess we'll never have it."

Salter Station's orbit had steadily taken it farther west, to the sunlit side of Earth. Now they looked directly down on the Atlantic Ocean. The tiny dark ulcers on the Earth's face had spread and merged. Most of Europe was totally obscured by a smoky pall, lit from within by lightning flashes and surface fire-storms. The East coast of the United States should have been coming into view, but it was hidden by a continuous roiling mass of dust and cloud.

And the missiles were still being launched to seek their targets. As enemy missiles hit and vanished from the displays new bright specks rose like the Phoenix from the seething turmoil that had been the United States, setting their paths over the pole towards Asia. The guiding hands that controlled them might be dead, but their instructions had long since been established in the control computers. If no one lived to stop it, the nuclear rain would fall until all arsenals were empty.

"Can you put together a facility for the operation?" asked de Vries at last. Unable to see the displays himself, he did not realize that everyone in the central control room was paralyzed by the scene of a dying Earth. His question was an urgent one, but no one would reply. Since the beginning of the day everything in de Vries's world had taken place in a slow dream, as though everything had already been running down before its final end.

"Can you build one?" he repeated.

Ferranti shivered, and finally replied. "If we wanted to we might be able to build a makeshift system to do the job —but it would take us at least five years. We'd be bootstrapping all the way, making equipment to make equipment."

She looked down again at Salter Wherry, and at once lost interest in talking further to de Vries. Wherry's breathing was shallower, and he was trembling. He appeared to be unconscious.

"Come on," she said to her assistant. "I didn't want to move him yet, but we have no choice. We have to take him back to the center. At once, or he'll be gone."

With Wolfgang's help, Wherry was carefully lifted on to the light-weight carrier. He still wore the breathing mask over his lower face. As he was lowered into position, his eyes opened. The pupils were dilated, the irises rimmed with yellowish-white. The eyeballs were sunk back and dark-rimmed. Wolfgang looked down into them and saw death there.

He begin to straighten up, but somehow the frail hand found the strength to grip his sleeve.

"You are with the Institute?" The words were faint and muffled.

"Yes." It was a surprise to find that Wherry was still able to speak.

"Come with me."

The weak voice could still command. Wolfgang nodded, then hesitated as Olivia Ferranti prepared to wheel Wherry slowly away. Charlene was speaking to de Vries again, asking the question that Wolfgang himself had wanted to ask.

"Jan," she was saying. "We've tried to reach Niles. Where is she?"

"She is here. On this ship." De Vries put his hands to his eyes. "She's unconscious. I didn't want her to come.

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I wanted her to wait, build up her strength, have the operation, then follow us. She insisted on coming. And she was right. But back on Earth, she could have been helped. Now . . ."

Wolfgang struggled to make sense of de Vries's words. But the frail hand was again on Wolfgang's arm, and the thread of voice was speaking again. "Come. Now. Must talk *now*."

Wolfgang hesitated for a second, then reluctantly followed the stretcher out of the control room.

Salter Wherry turned his head toward Wolfgang, and a dry tongue moved over the pale lips. "Stand close."

"Don't try to talk," said Ferranti.

Wherry ignored her. "Must give message. Must tell Niles what is to be done. You listening?"

"I'm listening." Wolfgang nodded. "Go ahead, I'll make sure that she gets the message."

"Tell her I know she saw through narcolepsy. Thought she might—too simple for her. Want her to know reason—real reason—why had to have her here."

There was a long pause. Wherry's eyes closed. Wolfgang thought that he had lapsed into unconsciousness, but when the old voice spoke again it sounded stronger and more coherent.

"I had my own reasons for needing her here—and she had hers for coming. I don't know what they were; I want her to know mine. And I want her to carry plan out here. I hoped we wouldn't blow ourselves up down there, but I had to prepare for worst. Just in time, eh?" There was a wheezing groan, that Wolfgang realized was a laugh. "Story of my life. Just in time. 'Nother day, we'd have been too late."

He moved his arm feebly as Ferranti took it to make an injection. "No sedatives. Hurts—in my chest—but I can stand that. You, boy." The eyes burned into Wolfgang. "Lean close. Can't talk much more. Tell you my dream, want you to tell Niles to make it hers."

Wolfgang stooped over the frail body. There was a long pause.

"Genesis. You remember Genesis?" Wherry's voice was fading, indistinct. "Have to do what Genesis says. 'Be fruitful and multiply.' Fruitful, and multiply."

Wolfgang looked quickly at Ferranti. "He's rambling."

"Not rambling." There was a faint edge of irritability still in the weak voice. "Listen. Made arcologies to go long way—seed universe. Be fruitful, and multiply. See? Self-sustaining, run thousand years—ten thousand. But can't do it. We're weak link. Fight, change minds, change societies, kill leaders, break down systems. Damned fools. Never last thousand years, not even hundred."

They had reached the Med Center, and Wherry was being lifted onto a table all prepared for emergency operations. A needle was sliding into his left arm, while a battery of bright lights went on all around them.

Wherry rolled his head with a last effort to face Wolfgang. "Tell Niles. Want her to develop suspended animation. That's why need Institute on station." The breathing mask had been removed, and there was a travesty of a smile on the tortured face. "Thought once I might be first experiment. See

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stars for myself. Sorry won't be that way. But tell her. Tell her. Cold sleep . . . end of everything . . . sleep . . ."

Olivia Ferranti was at Wolfgang's side. "He's under," she said. "We want you out of here—we're going to operate now."

"Can you save him?"

"I don't think so. This is the third attack." She bit her lip. For the first time, Wolfgang noticed her large, luminous eyes and sad mouth. "Last time it was a patch-up job, but we hoped it would last longer than this. One chance in ten, no more. Less unless we start at once."

Wolfgang nodded. "Good luck."

He made his way slowly back along the corridors. They were deserted; everyone on the station had retreated with his thoughts. Wolfgang, usually impervious to fatigue, felt drained and beaten. The explosions on Earth rose unbidden in his mind, a collage of destruction with Jan de Vries's sad face overlaid on it. The morning optimism and the joking inventory of supplies with Charlene felt weeks away.

He finally came to the control room. Hans was alone there, watching the displays. He seemed in a shocked trance, but he roused himself at Wolfgang's voice.

"The missile defense system has been turned off. They were too busy with themselves—down there—to waste their time on us. Your ships will start docking any time now."

"What's the situation . . ." Wolfgang nodded his head at the screen, where the big display showed the smudged and raddled face of Earth.

"Awful. No radio or television signals are coming out—or if they're trying, they're lost in the static. We tried for an estimate of released energy, just a few minutes ago. Thirty thousand megatons." Hans sighed. "Five tons of TNT for every person on the planet. There's night now, all over Earth—sunlight can't penetrate the dust clouds."

"How many casualties?"

"Two billion, three billion?" Hans shook his head. "It's not over yet. The climate changes will get the rest."

"*Everyone?* Everyone on Earth?"

Hans did not reply. He sat hunched at the console, staring at the screen. The whole face of the planet was one dark smear. After a few seconds Wolfgang continued back to his own quarters. Hans and the others were right. Soon the ships would be docking, but before that there was the need for solitude and silent grief.

Charlene was waiting for him in a darkened room. He went and took her in his arms. For several minutes they sat in silence, holding each other close. The pace of events had been so fast for many hours that they had been numbed, and only now did their awful significance begin to sink home. For Charlene in particular, less than twenty-four hours away from Earth and the Neurological Institute, everything had a feeling of unreality. Soon, she felt, the spell would break and she would return to the familiar and comfortable world of experiments, progress reports, and weekly staff meetings.

Wolfgang stirred in her arms. She lifted his hand and rubbed it along her cheek.

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"What's the news on J.N.?" he said at last. "I didn't like the look of de Vries."

Charlene shivered in the darkness. "Bad as it could be. Jan met with her this morning, when she had the final lab test results. She has a rapidly-growing and malignant brain tumor—even worse than we'd feared."

"Inoperable?"

"That's the worst part—that's what Jan de Vries was asking about. There is an operation and associated chemotherapy program, one that's been successful four cases out of five. But only a handful of places and people could perform it. There's no way to do it on Salter Station—you heard Ferranti, it would take five years' development."

"How long does she have?"

"Two or three months, no more." Charlene had held back her feelings through the day, but now she was quietly weeping. "Maybe less—the acceleration at launch knocked her unconscious, and that's a bad sign. It was only three-g. And every facility that could have done the operation, back on Earth, is dust. Wolfgang, she's doomed. We can't operate here, and she can't go back there."

He was again silent for a while, rocking Charlene back and forward gently in his arms. "This morning we seemed at the beginning of everything," he said. "Twelve hours later, and now it's the end. Wherry said it: the end of everything. I didn't tell you this, but he's dying, too. I feel sure of it. He gave me a message for J.N. to work on cold sleep for the arcologies. I promised to deliver it to her, and I will. But now it doesn't matter."

"They're all gone," said Charlene softly. "Earth, Judith Niles, Salter Wherry. What's left?"

Wolfgang was silent for a long time. In the darkness, feeling his body warm against her, Charlene wondered if he had really heard her. They were both beginning to drowse off, as nervous exhaustion drained away all energy. She felt too weak to move.

Finally Wolfgang grunted and stirred. He took a long, shivering breath.

"We're left," he said. "We're still here. And the animals, they're here too. Somebody has to look after them. They can't be left to starve."

He rested his head again on her shoulder. "Let's just stay here, try to sleep a little. Then we can go and feed old Jinx."

His words were broken and indistinct, fading into sleep. "Some things have to go on; even after the end of the world."

Chapter 11

For almost four hours there had been no conversation. Each of the three white-garbed figures was absorbed with his particular duties, and the gauze masks imposed an added isolation and anonymity. The air in the chamber was freezingly cold. The workers rubbed at their chilled hands, but they were reluctant to wear thermal gloves and risk decreased dexterity.

The woman on the table had been unconscious throughout. Her breathing was so shallow that the monitors' reassurance was necessary to tell of her survival and stable condition. Electrodes and catheters ran into her abdomen, chest cavity, nose, eyes, spinal

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column, and skull. A thick tube had been connected to a major artery in the groin, ready to pump blood to the chemical exchange device that stood by the table.

All was ready. But now there was hesitation. The three checked the vital signs one more time, then by unspoken agreement went outside the chamber and removed their masks. For a few seconds they looked at each other in silence.

"Should we really go through with it?" said Charlene abruptly. "I mean, with the uncertainties and the risks—we have no experience with a human. Zero. And I'm not sure how any of the drug amounts should be adjusted for different body mass and body chemistry—"

"What action would you suggest, my dear?" Jan de Vries had been the one who opposed the idea most vehemently when it was first proposed, but now he seemed quite calm and resigned. "Bring her body temperature back to normal? Try to wake her? If that is your suggestion, propose it to us. But *you* must be the one, not I, to face her and explain why we did not accede to her explicit wishes."

"But what if it doesn't work?" Charlene's voice was shaking. "Look at our record. It's so risky. We've had Jinx in that mode for only three weeks, that's all."

"And you argue that your experience with the bear is not applicable?"

"Who knows? There could be a hundred significant differences—body mass, pre-existing antigens, drug reactions. And some a lot more improbable than that. For all we know, it works for Jinx because of some *previous* drug used in our experiments with him. Remember, when we did the same sort of protocol with Dolly, it killed her. We need to try other tests, other animals—we need more time."

"We all know that." Wolfgang Gibbs didn't share de Vries's fatalist calm, or Charlene's nervous vacillation. He seemed to have an objective interest in the new experiment. "Look at it this way, Charlene. If we can move J.N. into Mode Two in the next few hours, one of two things will happen. If she stays stable and regains consciousness, that's fine. We'll try to communicate with her and find out how she feels. If we get her into Mode Two and she's *not* stable, we can try to bring her back to normal. If we succeed we'll have the chance to try again. If we fail, she'll die. That's what you're worried about. But if we don't *try* to stabilize in Mode Two, she's dead anyway—remember the prognosis. She'll be gone in less than three months, and we can't change that. Ask it this way: if it were you on that table, what would you want us to do?"

Charlene bit her lip. There was a dreadful temptation to do nothing, to leave J.N. with her body temperature down close to freezing while they deliberated. But the temperature in the chamber was still dropping. Within the next half hour they had to bring Judith Niles back up to consciousness, or try for Mode Two.

"What's the latest report on Jinx?" Charlene said abruptly.

"He's fine."

"Right. Then I say, let's go ahead. Waiting won't help anything."

If the other two were startled at the

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sudden change of attitude, neither mentioned it. They adjusted their masks and went back at once into the chamber. Already the temperature inside had dropped another degree. The monitors recorded a pulse rate for Judith Niles of four beats a minute, and the chilled blood was driven sluggishly through narrowed veins.

The final stage began. It would be carried out under computer control, with the humans there merely to provide an override if things went wrong. Jan de Vries initiated the control sequence. Then he went across to the still figure on the table and gently placed the palm of his hand on her cold forehead.

"Good luck, Judith. We'll do our best. And we'll be communicating with you—God willing—when you get there."

He stood looking at her face for a long time. The carefully measured drug injections and massive transfusion of chemically changed blood had already begun. Now the monitors showed strange patterns, steady periods alternating with abrupt changes in pulse rate, skin conductivity, ion balances, and nervous system activity. Oscilloscope displays showed unpredictable peaks and valleys of brain rhythms, as cycles of waves rose, fell, and merged.

Even to the experienced eyes of the watchers, everything on the monitors looked odd and unfamiliar. And yet that was no surprise. As she had requested, Judith Niles was embarked on a strange journey. She would be exploring a region where blood was close to freezing, where the body's chemical reactions proceeded at a fraction of their usual rates, where only a few hibernating animals and no human had ever ventured and returned to life.

The frozen heart slowed further, and the blood drifted lazy along cold arteries and veins. The body on the table suddenly shuddered and twitched, then was quiet again. The monitors fluttered a warning.

But there would be no going back now. The search was on. In the next few hours, Judith Niles would be engaged in a desperate quest. She had to find a new plateau of physiological stability, down where no human had ever gone before; and her only guide was the uncertain trail left by one Kodiak bear.

A.D. 27698

"Any sufficiently advanced technology is indistinguishable from magic" —Proverbial, attributed to the pre-Flight philosopher/writer Isaac(?) Clarke, 1984(?)–2100(?) (Old Calendar); Central Record Library, Pentecost. (Bubble memory defective; this section of records unreliable)

Chapter 12. Pentecost

The last shivering swimmer had emerged from the underground river, and now it would be possible to assemble the final results. Peron Turco pulled the warm cape closer about his shoulders and looked back and forth along the line.

There they stood. Four months of preliminary selection had winnowed them down to a bare hundred, from the many thousands who had entered the original trials. And in the next twenty

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minutes it would be reduced again, to a jubilant twenty-five.

Everyone was muddied, grimy, and bone-weary. The final trial had been murderous, pushing minds and bodies to the limit. The four-mile underwater swim in total darkness, fighting chilling currents through a labyrinth of connecting caves, had been physically demanding. But the mental pressure, knowing that the oxygen supply would last for only five hours, had been much worse. Most of the contestants were slumped now on the stone flags, warming themselves in the bright sunlight, rubbing sore muscles and sipping sugar drinks. It would be a little while before the scores could be tallied, but already their attention was turning from the noisy crowds to the huge display that formed one outer wall of the coliseum.

Peron shielded his eyes against Cassay's morning brilliance and studied each face in turn along the long line. By now he knew where the real competition lay, and from their expressions he sought to gauge his own chances. Lum was at the far end, squatting cross-legged. He was eating fruit, and he looked bored and sweaty. Somehow Pentecost's hot summer had left his skin untouched. He stood out with a winter's paleness against the others.

Ten days ago Peron had met him and dismissed Lum as soft and overweight, a crudely-built and oafish youth who had reached the final hundred contestants by a freakish accident. Now he knew better. The fat was mostly muscle, and when necessary Lum could move with an incredible grace and speed; and the fat face and piggy eyes hid a first-rate brain and formidable imagination. Peron had revised his assessment three times, each one upwards. Now he felt sure that Lum would be somewhere high in the final twenty-five.

And so would the girl Elissa, three positions to the left. Peron had marked her early as formidable competiton. She had started ten minutes ahead of him in the first trial, when they made the night journey through the middle of Villasylvia, the most difficult and dangerous forest on the surface of Pentecost.

Peron had been very confident. He had been raised in wooded country. He was strong and agile, and his sense of direction was better than anyone he had ever met. After two hours, when he had failed to overtake Elissa, he was convinced that the dark-skinned girl had gone astray and was lost in the dangerous depths of Villasylvia. He had felt mildly sorry on her behalf, because before they began she had smiled and wished him luck; but most of his attention was on avoiding the darters and night-lappers that ruled the nightwoods.

He had made splendid time, striking a lucky path that took him back to base without any detours or backtracking. It had come as a great shock to reach home and find her there well before him, fresh and cheerful, and humming to herself as she cooked her breakfast.

Now Elissa turned to look at him while he was still staring along the line at her. She grinned, and he quickly averted his eyes. If Elissa didn't finish among the winners that would be bad news for Peron, too, because he was convinced that wherever they placed she would rank somewhere above him.

He looked back at the board. The markers were going up on the great dis-

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play, showing the names of the remaining contestants. Peron counted them as they were posted. Only seventy-two. The last round of trials had been fiercely difficult, enough to eliminate over a quarter of the finalists completely. No Planetfest celebration for them. They would already be headed back to their home towns, too disappointed to wait and find out who the lucky winners might be.

Peron frowned and looked again along the line of finalists. Where was Sy? Surely he hadn't failed to finish? No, there he was, lounging a few yards behind the others. As usual, he was easy to miss—he blended inconspicuously into any scene, so that it had taken Peron a while to notice him. He shouldn't have been difficult to pick out, with his black hair, bright gray eyes, and slightly deformed left forearm. But he was somehow difficult to *see*. He could sink into the background, quietly observing everything with the cynical and smug expression that Peron found so irritating—perhaps because he suspected that Sy really *was* superior? Certainly, on anything that called for mental powers he had effortlessly outperformed Peron (and everyone else, according to Peron's rough assessment); and where physical agility or strength was needed, Sy somehow found a way to compensate for his weakened arm. It was a mystery how he did it. He was never in the first rank for the most physical of the trials, but given his handicap he was much higher than anyone could believe.

Now Sy was ignoring the display and concentrating all his attention on his fellow contestants, clearly evaluating their condition. Peron had the sudden suspicion that Sy already knew he was in the top twenty-five and was looking ahead, laying his plans for the off-planet tests that would determine the final ten winners.

Peron wished he could feel that much confidence. He was sure (wasn't he?) that he was in the top thirty. He *hoped* he was in the top twenty, and in his dreams he saw himself as high as fourth or fifth. But with contestants drawn from the whole planet, and the competition of such high caliber . . .

The crowd roared. At last! The scores were finally appearing. The displays were assembled slowly and painstakingly. The judges conferred in great secrecy, knowing that the results would be propagated instantly over the entire planet, and that a mistake would ruin their reputations; and the individuals responsible for the displays had been influenced by the same obsession with care and accuracy. Everything was checked and rechecked before it went onto the board.

Peron had watched recordings of recent Planetfests, over and over, but this one was different and more elaborate. Trials were held every four years. Usually the prizes were high positions in the government of Pentecost, and maybe a chance to see the Fifty Worlds. But the twenty-year games, like this one, had a whole new level of significance. There were still the usual prizes, certainly. But they were not the real reward. There was that rumored bigger prize: a possible opportunity to meet and work with the Immortals.

And what did *that* mean? Who were the Immortals? No one could say. No one Peron knew had ever seen one, ever

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met one. They were the ultimate mystery figures, the ones who lived forever, the ones who came back every generation to bring knowledge from the stars. Stars that they were said to reach in a few days—in conflict with everything that the scientists of Pentecost believed about the laws of the Universe.

Peron was still musing on that when the roar of the crowd, separated from the contestants by a substantial barricade and rows of armed guards, brought him to full attention. The first winner, in twenty-fifth place, had just been announced. It was a girl, Rosanne. Peron remembered her from the Long Walk across Talimantor Desert, when the two of them had formed a temporary alliance to search for underground water. She was a cheerful, tireless girl, just over the minimum age limit of sixteen, and now she was holding her hand to her chest, pretending to stagger and faint with relief because she had just made the cutoff.

All the other contestants now looked at the board with a new intensity. The method for announcement was well established by custom, but there was not a trial participant who did not wish it could be done differently. From the crowd's point of view, it was very satisfying to announce the winners in ascending order, so that the name of the final top contestant was given last of all. But during the trials, every competitor formed a rough idea of his or her chances by direct comparison with the opposition. It was easy to be wrong by five places, but errors larger than that were unlikely. Deep inside, a competitor knew if he was down in ninetieth place. Even so, hope always remained. But as the names gradually were announced, and twenty-fourth, twenty-third, and twenty-second position was taken, most contestants were filled with an increasing gloom, panic, or wild surmise. Could they possibly have placed so high? Or, more likely, were they already eliminated?

The announcements went on steadily, slowly, relentlessly. Twentieth position. Seventeen. Fourteen.

Number ten had been reached: Wilmer. He was a tall, thin youth whose head was completely hairless. Either he shaved it daily, or he was prematurely bald. He was always hungry and always awake. The rest of them had joked about it—Wilmer cheated, he refused to go to sleep until everyone else had nodded off. Then he slept *faster* than other people, which wasn't fair. Wilmer took it all good-naturedly. He could afford to. Needing hours less sleep than the others, he could spend more time preparing for the next trial.

Now he lay back on the stones and closed his eyes. He had always said that when this stage of the trials was over he would sleep for ten days solid.

The list advanced to number five. It was Sy. The dark-haired youth appeared to be as cool as ever, with no visible sign of pleasure or relief. He was standing with his head slightly inclined, cradling his weak left elbow in his right hand and not looking at anyone else.

Peron felt his own stomach tightening. He had passed the positions he expected to occupy; now he was in a region where only his wildest hopes had taken him.

Number four: Elissa. She whooped with delight. Peron knew he should feel

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pleased, but he had no room in him now for pleasure. He clasped his hands tightly together to stop them from shaking, and waited. The display was static, never changing. The coliseum seemed to be full of a terrible silence, though he knew the crowd must be cheering wildly.

Number three. The letters went up slowly. P-E-R-O-N O-F T-U-R-C-A-N-T-A. He felt his lungs relax in a long, tortured gasp. He had been unconsciously holding his breath for many seconds. He had done it! Third place. *Third place!* No one from his region had ever placed so high, not in four hundred years of Planetfest games.

Peron heard the rest of the results, but they scarcely registered. He was overwhelmed with pleasure and relief. Some part of his mind puzzled when the second place winner, Kallen, was announced, because he hardly recognized the name. He wondered how they could have passed through so many difficult trials together without ever having spoken to each other. But everything—the crowd, the coliseum, the other contestants—seemed miles away, mirages in the bright yellow sunlight.

The last name appeared, and there was a final huge roar from the crowd. Lum! Lum of Minacta had won first place! No one would begrudge him his triumph, but he would be a sad disappointment to all the parents who urged their sons and daughters to live good lives so that they could be the winner of the Games. Who would want to be a winner, if it meant growing up big, meaty, and coarse-looking like this year's?

There was a commotion at the end of the line. Two of the girls near to Lum had given him a hug, then tried to lift him onto their shoulders to carry him forward in triumph toward the crowd. After a few moments it became obvious that he was too heavy. Lum leaned forward, grabbed one girl in each arm and lifted them up. They perched, one on each shoulder, as he strode forward to the barricade. He held up his hands and did a quick pirouette, while the crowd went berserk.

"Come on, misery!" The voice came from Peron's side. It was Elissa, who grabbed his arm as he turned to face her. "You look as though you're going to sleep. Let's get in and celebrate—we're *winners!* We should act like it."

Before he could object she was dragging him forward to join the others. The party was beginning. Winners and losers, everyone had lost his fatigue. Now that the contest was over, and the bets had been decided, the crowd would treat them all as winners. Which they were. They had survived the most grueling tests that Planetfest could provide. And now they would celebrate until Cassay went down in the sky, until only the feeble red light of Cassby was left to lead them to their dormitories.

Planetfest was over for another four years. Few people ever stopped to think that the final winner had not yet been selected. The last trials took place off-planet, away from the high publicity, far away where no announcements were made. The contestants knew the truth: a tougher, unknown phase still lay ahead, where the only prize would be knowledge of victory. But the cash prizes, the celebrations by whole prov-

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inces, the public applause, and the generous family pensions were not based on off-planet results. So to most of the inhabitants of Pentecost—to almost everyone but the finalists themselves—the planetary games were over for another four years.

An Lum's name, Lum of Minacta, stood above all others.

Chapter 13

"I'm sure you feel you've been through a lot. Well, it's my job to tell you that hard times are just beginning. Take a word from Eliya Gilby, you've seen *nothing*. Compared with the off-planet tests, the crappy Planetfest games are for kiddies."

The speaker was a thin, gray-haired man dressed in the black leather and glittering brass of a System Guard. His face wore a sardonic smile that could be read equally as pity, contempt, or dyspepsia. He was unable to stand still as he spoke. He paced in front of the silent group, and all the time his hands were also in motion, pulling at his belt, adjusting his collar, or rubbing at bloodshot eyes.

The Planetfest winners who made up his audience were in much better shape. The offers of drinks, drugs, and stimulants from the celebrating well-wishers had been numerous, but years of preparation for the trials had taught the contestants self-control. And a quiet sleep until almost midday, without having to plan for the next trial, had been a restorative and a luxury. They looked at each other as the guard was speaking, and exchanged secret smiles. Captain Gilby was in terrible condition. He had refused no offers of free drinks, by the look of it. There was no doubt that he was hung over—and badly—from a night's long revelry.

Captain Gilby moved his head from side to side, very slowly. He grunted, sighed, and cleared his throat. "Bloody hell. All right, here we go. It's my job to try to explain the Fifty Worlds to you. But I can tell you now, there's no real way you'll know what they're like until you've been there for yourself. Take my word for it, I've made six trips off planet, with six lots of you winners, all over the Cass system. And everybody tells me when they see the real thing that my pictures are useless. And I agree. But my bosses won't listen to that, so today that's what you get. Pictures. They won't give you more than a faint idea, but they're *all* you'll get until next week."

He sniffed, bent forward slowly and carefully, and lifted up a large, flat case. "Let's take a look at a few pictures of Barchan, in near to Cassay. There's a hell-hole for you, if you want my opinion. I suppose it's too much to hope that any of you already know something about it?"

Wilmer looked around him, then raised a tentative hand. "I do."

Gilby stared at him. "Do you now? Mind telling me how, since that sort of knowledge shouldn't be public down on Pentecost."

"My uncle was a Planetfest winner, twelve years ago. Last year I asked him about the off-planet trials."

"Before you even started on the first round for Planetfest! Cocky little bastard, aren't you? So tell us all about Barchan."

"Sand dunes, just like the picture

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shows. Primitive vegetable life, no animals, not much atmosphere. And hot as blazes except at the poles. Hot as melted lead.'' Wilmer hesitated, then added: ''Not my choice for a trial. If it's held there it will mean hotsuits all the time.''

''Now then, no trying to influence the others,'' said Gilby mildly. While Wilmer had been talking a tray of hot drinks had arrived, and the captain was eyeing it longingly. ''But the rest of what you say is right enough. Hot enough to boil your balls off in two minutes, if your suit fails. And if you *have* balls. Barchan is only a hundred and twenty million kilometers from Cassay. Let's look at another one, a bit farther out. This is Gimperstand. Know anything about it?''

Gilby was holding up two pictures. One showed a space view of a greenish-brown ball, the other a lush jungle of incredibly tangled vines. Wilmer shook his head, and no one else seemed ready to speak.

''And you probably don't want to. It's officially Gimperstand, but the unofficial name we have for it is *Stinker*. And it deserves it. There's an atmosphere. It's a little thin, but in principle it's breathable. I've tried it. Two breaths make you run off and puke. It's something one of the vines releases, and it makes night-lapper shit smell like honeysuckle. A real stinkeroo. One whiff of it will knock you flat.''

He held the pictures out delicately at arm's length, then dropped them back into the case.

''We have a lot of ground to cover, but I don't think we'll do it all right now. For a start, I don't think you lot can absorb much at a time. And for a second, I want one of those drinks or I'll fall down right here.'' He walked over to the tray and grinned unpleasantly at his audience. ''I'm glad it's you doing the trial, not me. We've got some monsters out there in the Cass system. You've seen the official planet names in school, but that's not what people who've been there call them. And their names are a lot more accurate. There's Bedlam, and Boom-Boom, and Imshi, and Glug, and Firedance, and Fuzzball. And when we get to the Outer System, it's even worse. We've got to take a look at Goneagain, and Jellyroll, and Whistlestop, then Whoosh, Pinto, Dimples, Camel, and Crater. They're not called the Fifty Worlds for nothing, and every one can be a death trap.'' He picked up a flask, took a tentative sip, and gave his audience another sadistic grin. ''Don't you think your worries are over. By the time the off-planet tests are done you'll be wishing that you'd gone back home today with the losers.''

The whole afternoon had been devoted to briefings, by Gilby and others. Then came news conferences and meetings with the VIP's from each winner's home area. It was late evening before they had any time to themselves, or even time for food. Peron had found a quiet place in a corner of the food area and was eating alone. But he was more than pleased when Elissa carried a tray over and seated herself opposite him uninvited.

''Unless you're hiding away for a good reason, I thought I'd join you. I've already talked to Lum and to Kallen, now I want to pay my respects to you.''

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"You're working down the whole list of winners, in order?"

She laughed. "Of course. Doesn't everyone? No, I was just joking. I'm interested in you, so I thought it would be nice to eat dinner together—unless you really are hiding away?"

"I'm not. I'm brooding. I've just been sitting here and thinking how damnably rude everybody has been today. It started this morning with Captain Gilby, and I just assumed it was his hangover. But it's been getting *worse*. We're polite to everyone, and people we meet—complete strangers, most of them—treat us like dirt."

"Of course they do," said Elissa. "Better get used to it. They don't mean any harm. But see, we're the Planetfest winners, names in lights, and that makes us a big deal. A lot of people have to keep telling themselves that we're not all that great, that they're just as good as we are. And one way they convince themselves of that is by putting us down."

"I'm sure you're right." Peron looked at Elissa with respect. "But I wouldn't have thought that way. You know, this is going to sound stupid, but I still can't believe that I came higher than you in the rankings. You did better than I in everything. And I think you think better. I mean, more perceptively. I mean, you're—"

"If you're getting ready to ask me to go out for a walk," said Elissa, "there are more direct ways." She leaned forward and put her hand on Peron's arm. "All you have to do is say it. You're the exact opposite of Sy. He thinks everybody else is some sort of trained ape. But you always undervalue yourself. That's rare for a winner in Planetfest. Most people are like me, pushy. And as for Lum—"

"And as for Lum—" echoed a voice behind her. "What about him? Something nice, I hope."

It was Lum, and he had with him Kallen, the second place winner.

"Good. It's convenient to find you two together," he said. He hoisted one huge thigh and buttock to perch on the corner of their table, threatening to overturn the whole thing. "Do you feel up to another interview tonight? The Planetfest organizers would like to meet with the top five."

"First things first, Lum," said Elissa. "Peron, you have to meet the mystery man. This is Mario Kallen."

"Hello." Peron stood up to take the hand of the second place winner, and found he was grasping empty air. Kallen was blushing a bright red, and looking away.

"Pleased to meet you." The voice was a whisper, deep in the throat. Peron looked at Kallen again, and noticed for the first time the red lines of scar tissue on his Adam's apple.

"Let's all sit down," said Lum cheerfully. "We have an hour yet before the interview, and I want to tell you what Kallen has been telling me, about Planetfest."

"Don't you have to find Sy, too?" asked Elissa.

"I already did. He told me to go to blazes, said he didn't want any fool interviews." Lum pulled back the bench so that he and Kallen could sit down. "He's an interesting case, old Sy. I don't know how he could do so well with that injured arm, but he certainly

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didn't get any extra points from the judges for tact and diplomacy."

Elissa winked at Peron. Nor does Lum, said her smile. She turned innocently back to the other two.

"I've thought of nothing but Planetfest for two years. But I'd like to hear something new."

"You will," said Lum grimly. "Go on, Kallen."

Kallen sat for a moment, rubbing his hands together. He again turned red with embarrassment. "I thought of nothing but Planetfest, too," he said at last, in that throaty, pained voice. Then he hesitated, and looked helplessly from one person to the next. What had been difficult to tell to one person was impossible to tell to three.

"How about if I say it, and you tell me when I get it wrong?" said Lum quickly. "That way I'll have a chance to see if my understanding is correct."

Kallen nodded gratefully. He smiled in a sheepish fashion at Elissa, then looked away to the corner of the room.

"I suspect we all did the same sort of thing when we started out in the trials," said Lum. "Once I knew I was going to be involved, I set out to discover everything I could about the Planetfest games—when they started, how they're organized, and so on. I'd heard all the vague legends—about the Gossameres, and the Immortals, and Pipistrelle, and Skydown, and the Kermel Objects. And S-space, and N-space. I wanted to know what they were all about, or at least get the best rumors I could."

Peron and Elissa nodded assent. It was exactly what they had done themselves.

"But Kallen's case was a little different. He was legally old enough—just—for the *previous* games. He was born on the exact cutoff date, right at midnight. And he went through all the preliminary rounds then. He aced them."

Kallen blushed a brighter red. "Never said that at all," he whispered.

"I know. But it's true. Anyway, that's when he had his accident. A carriage wheel broke apart as it went past him, and a piece of a spoke speared his throat. It cost him his vocal chords, and it took him out of circulation for almost a year. And of course it killed off all his hopes for the trials. That looked like the end of it, except that Kallen was born in border country, between two planetary time zones. He found out his birth was recorded twice, in two different zones. According to one zone he was an hour younger. Still young enough to try again, in *this* trial. So he applied again, and here he is.

"But before the trials began this time, he was very curious to catch up on the results of the last one. He remembered the people who had competed, and he was pretty sure, from his own experiences, who the winners would be. He checked, and sure enough he was right. The top twenty-five had seven people he remembered. And in the off-planet tests, three of those had finished in the final ten. They had gone through the preliminary rounds with Kallen, and they'd all become pretty good friends."

Peron and Elissa were listening, but they were both beginning to look a little puzzled. It hardly seemed that Kallen's tale held any surprises.

Lum had caught the look that passed between them. "Wait a bit longer before

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you yawn off," he said. "You'll find something to keep you awake in a minute. I did.

"He tried to get in touch with them, but not one of them had gone back to his home region. According to their families, they were all working in big jobs for the government, and they all sent messages and pictures home. Kallen saw the videos, and it was the same three people he remembered. And the messages replied to questions from their families, so they couldn't be old videos, stored and sent later. But they never came home themselves, not in four years. They had stayed off-planet. They were out there, somewhere in the Fifty Worlds."

Kallen lifted his hand. "Don't assume that," he whispered. "I don't assume that."

"Quite right. Let's just say they *might* be somewhere in the Cass system. Or they could be even farther away. Anyway, at that point, Kallen got nosy. He checked back to the previous Planetfest, the one before he was involved. With over a billion people on Pentecost, the odds that you'll know a finalist personally are pretty small. But you know the old idea, we're only three people away from anybody. You'll know somebody who'll know somebody who'll know the person you want to get to. Kallen started looking—he's persistent, I found that out the hard way in the Seventh Trial, when we were both lost in The Maze. And he finally found somebody who had been knocked out in the preliminary trials from the earlier 'Fest, but who was a friend of a winner. And *that* winner had never been home since the off-planet trials."

Lum paused and stared at Peron, who was nodding his head vigorously. "You don't seem very surprised. Are you telling me you know all this?"

"No. But I had a similar experience. I tried to reach a former winner from our region, and I got the run-around. She was supposed to be off-planet, and unavailable, but she'd be happy to answer written questions. And she did, eventually, and sent a video with it. Kallen, are you suggesting that none of the off-planet winners come back to Pentecost? That doesn't seem to make much sense. Why would they want to stay away?"

Kallen shrugged.

"No reason that we can think of," said Lum. "Let me give you the rest of it. When Kallen went through the preliminaries on the previous Planetfest, there was a contestant called Sorrel. He never came first in any trial, but he was always high enough to make the cutoff for the next round. He was easy-going, and popular, and he seemed to hit it off well with the guards, but he never got any publicity from the government media. Three other things: he never seemed to need much sleep; he tended to know bits and pieces of information that others didn't—because a cousin of his had been a finalist in a previous 'Fest. And he was completely bald. That make you think of anybody we know?"

"Wilmer," said Elissa and Peron in unison.

"But he can't be," went on Elissa. "He couldn't compete twice. He wouldn't be allowed to, unless he was a freak like Kallen—oh, don't look like *that*, you know what I mean, he'd have

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to be born at just the right time at exactly where two zones meet."

"Didn't compete—twice," said Kallen softly.

"Sorrel and Wilmer don't look anything like each other," added Lum. "Kallen is absolutely sure they are two different people. Wilmer didn't compete twice."

"Or even once?" said Peron thoughtfully. "We traveled back together after the Polar Trial. And I couldn't get a word out of him about the way he'd handled the glacier crossing and crevasses. He just grinned at me. I thought at the time, he's so cool and fresh, it's hard to believe he's just spent fourteen hours stretched to the limit."

"*I agree,*" *said Lum.* "*After I heard* what Kallen had to say I had the same feeling. Wilmer's not a real contestant at all. He's a plant. I don't think he took part in any of the trials—no one saw him *during* them, only before and after. The question is, why put an outside observer in with the contestants?—and a completely bald one, at that, which makes him easy to remember."

"My father told me before I entered," said Peron. "There's more to Planetfest than the government wants to tell. He hates the government of Pentecost, and he didn't want me to take part in these trials. He says we've lived for the past four hundred and fifty years at a standstill, without real progress, ever since Planetfest began. But I didn't take much notice. He lives for underground politics, and since I was ten years old I've expected that one day he'll be arrested. Now you seem to be agreeing with him, the 'Fest had things in it that we've never been told about."

"But it doesn't answer Lum's question," said Elissa. She was tracing patterns in water droplets on the table top, but now and again her eyes did a quick survey of the room to see if anyone was watching them.

"Not yet," agreed Peron. "But give me a minute, and let me tell you the way my father would see it. First, Wilmer. Suppose he is a government plant. Then he is observing us for a definite reason. My father would say, there's no point in his presence if it has no effect on the Planetfest trial results. So that suggests the results are being tampered with—so that the right people win. But I just don't believe that. Too many people are involved in the evaluation and *judging. So it has to be a little more* subtle. Somebody wants to know how the winners will behave when faced with certain facts. And that's consistent with Kallen's other observation: something that we haven't been told about yet happens to Planetfest winners. Maybe not to all of them, but at least to some of them."

The other three were silent for a long time. They were looking at Peron expectantly. He finally realized that they were simply waiting. He remained silent himself, until at last Lum glanced at his watch.

"Five minutes more, then we have to go." His voice was respectful. "Carry on, Maestro, keep going and tell us the rest. I'm sure you're right so far. I'm beginning to feel less and less entitled to that number one rating."

Peron looked intently at each of the others. Elissa's eyes were downcast, staring thoughtfully at the table. Kallen and Lum were both visibly excited.

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"First of all," Peron said. "If we know of *one* government plant in the group, there could be others. So we don't say anything to anyone, unless we're absolutely sure of the other contestant. That means people we knew before, or people we've worked with on trials who couldn't be fake competitors. What about Sy?"

Kallen shook his head. "He is a genuine competitor," he whispered. "And an amazing one. I spent time with him during some of the trials. He is much more intelligent and resourceful than any of us, but because of that withered arm he sees the world through a distorting mirror. We should tell him —though it will confirm all his worst suspicions about people."

It was Kallen's longest speech to the group. He seemed to realize that, and smiled at Elissa in an embarrassed way.

"All right, Sy is in," said Lum. "What else, Peron?"

It was disconcerting to be treated as an authority. Peron chewed at a fingernail, and thought hard.

"We don't have to do anything at all," he said at last. "Except keep our eyes open and our mouths shut. You see, it's obvious from what Kallen told you that at some point we *will* learn the mystery of the off-planet trials. The earlier winners must have been told. So we'll be told, too, and we'll find out what happens to the winners after the off-planet contest is over. There's no suggestion that anything bad happens to us—just that something is going on that the government doesn't want the public to know. I tend to agree with my father, that in itself is a bad thing. But until we know what it is, we can't disagree with it. So it's simple: for the moment we try to define how many of our group of twenty-five we can really trust. And from now on we question everything that we're told."

"You think we should even discuss this with others?" Lum stood up. "My preference is to tell no one else at all."

"We need all the eyes and ears we can find," said Peron. "We'll be careful."

They moved as a group to the exit, not speaking again until they were outside the food hall and heading for the Planetfest communication headquarters.

Lum and Kallen walked on ahead, leaving Peron and Elissa to stroll side by side through the chilly autumn air. Little Moon had already risen, and off near the horizon the red fire of Cassby threw long, ochre shadows across the deepening twilight.

Elissa stopped and looked up at the sky. It was clear, and the stars were slowly appearing through the dusk.

"We'll be up there in a few days," said Peron. He took her arm in his. "We'll see the Fifty Worlds, and maybe we'll see The Ship. I've dreamed of that since I was four years old."

"I know. So have I. My aunt doesn't even believe there is a Ship. She says we've been here on Pentecost forever."

"What did you tell her?"

"Nothing. For someone with that view, logic is irrelevant—she'll believe what she chooses, regardless of evidence. Her religion says God placed us here on Pentecost, and for her that's the end of the argument."

"And you?" Peron was aware that she had moved in very close to him. "What do you think?"

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"You know what I think. I'm cursed with a logical mind, and a lot of curiosity. That's why I'm taking a good look. Once we go up there, away from the planet, the sky will all be changed." She sighed. "When I used to think about going off planet, back when I was little, it almost seemed the same as going to heaven. I thought that everything would be different there. No controls, no security officers, no guards, everything clear and simple. Now it's going to be another horrible contest."

Peron nodded. "That's why they won't let us be contestants after we're twenty years old. To do your best in the 'Fest, it's fatal if you question what you're doing too much. The trials need an uncluttered mind."

"Which we'll never have again. We've left the cradle, and there's no going back. Let's hope we'll find compensations." She took his hand and ran her fingertips gently over the palm. "Come on, let's get the interview over. Then you can take me for that walk—the one you were all ready to ask me about when Lum arrived."

Chapter 14

For the most of the journey up, Captain Gilby had harangued them incessantly. He had pointed out the features of the ship, dwelling in detail on the things that could go wrong during the ascent phase; he had told them, again and again, that freefall sickness was all psychological, to the point where they would go to any lengths to vomit in private; and he had asked each of the twenty-five to point out his own region of Pentecost as the orbit carried them over it, sniffing contemptuously at their failures. Recognizing a familiar land area from space turned out to be harder than any of them had anticipated. Cloud cover, haze, and oblique angle changed all the usual elements of identification.

But finally, when the spacecraft was nine thousand kilometers above Pentecost and approaching The Ship, Gilby fell silent. This was a case where he had learned to let the event itself overwhelm the contestants, without his assistance.

The craft that had carried them up from the surface of Pentecost was bigger than anyone had expected. A vessel capable of carrying thirty people did not sound particularly large, even knowing in principle how much capacity was needed for fuel. The reality had rendered them speechless. They would ride to space at the top of a mammoth obelisk, towering twenty stories high above the flat plain of the Talimantor Desert.

Now they were facing another change of scale. The Ship had first appeared on the screens as a point of light, far above and ahead of them. As they slowly closed with it, and features became visible, the dimensions could be seen if not comprehended. They were looking at an irregular ovoid, a swollen ball covered with pimples, hair and scratches, like a diseased and mottled fruit. Closer approach brought more details. Each of the small nipples on the underside was a complete docking facility, capable of receiving a vessel the size of the one they rode in; the thin, hair-fine protrusions on the side were landing towers; the regular scratches were composed of a multitude of fine dots, each of them an entry port to the hull.

All conversation had ceased. They all realized the significance of the moment.

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They were looking at The Ship, the mystical, almost mythical structure that had carried their ancestors across the void from Earth, from a place that was so far away in time and space that it was beyond imagining.

"Take a good look at it," said Gilby at last. His lecture was continuing, but his voice had a different tone. "That was the only home of your ancestors for fifteen thousand years—three times as long as we've lived on Pentecost. The Ship roamed from system to system, never finding anywhere that could be a new home. It visited forty-nine suns and a hundred planets; and everywhere it was frozen, dead worlds, or burning deserts. Cass was the fiftieth system, and they found Pentecost. It was right to support human life. Paradise, eh? Do you know what happened then?"

They all remained silent, overwhelmed by the swelling presence of The Ship as it filled the screen in front of them.

"They argued," said Gilby. He paused in his fidgeting with his shoulder strap to touch his gunbelt. "They squabbled in The Ship, over whether or not they should leave it and land on Pentecost. The Ship was home, and half the people didn't want to leave it. It took two hundred years before the final transfer down took place and The Ship was left deserted. The final act was to move it to a high orbit, where it could circle Pentecost forever."

They had approached within a couple of kilometers, and were spiraling slowly around the shining hull. There was a burred, matte finish to the surface, the evidence of eons of meteor impact and the scouring of interstellar dust.

"Any chance we can all go on board?" asked Wilmer. Like a small child, he had pressed his nose to the transparent port.

Gilby smiled. "It's a shrine. No visitors allowed. The original travelers stated only one situation in which The Ship could be opened up to use again. It's not one we care to think about. The Ship will be re-opened and refurbished if nuclear weapons are ever used on Pentecost."

He pointed to the port. "Look out there now, and fix it in your memories. You won't see this again."

As he spoke they felt a steadily increasing acceleration pressing them back into the seats. The Ship moved past their spacecraft, fell behind, and dwindled rapidly in size. They were heading farther out, out to the sprawling menagerie of planets that moved around and beyond Cassay and together made up the Fifty Worlds.

Seen through the best Earth telescopes, the system of Eta Cassiopeiae had been no more than twin points of light. It appeared as a striking red-and-gold binary, a glittering topaz-and-garnet jewel less than twenty light-years away from Sol. No amount of magnification by Earth observers could give any structural detail of the stellar components. But to the multiple sensors of *Eleanora*, curving on a slow trajectory toward the brighter component of Cassiopeia-A, a system of bewildering complexity had revealed itself.

Cassiopeia-A is a yellow-gold star, stellar type GO V. It is a little brighter and more massive than Sol. Its com-

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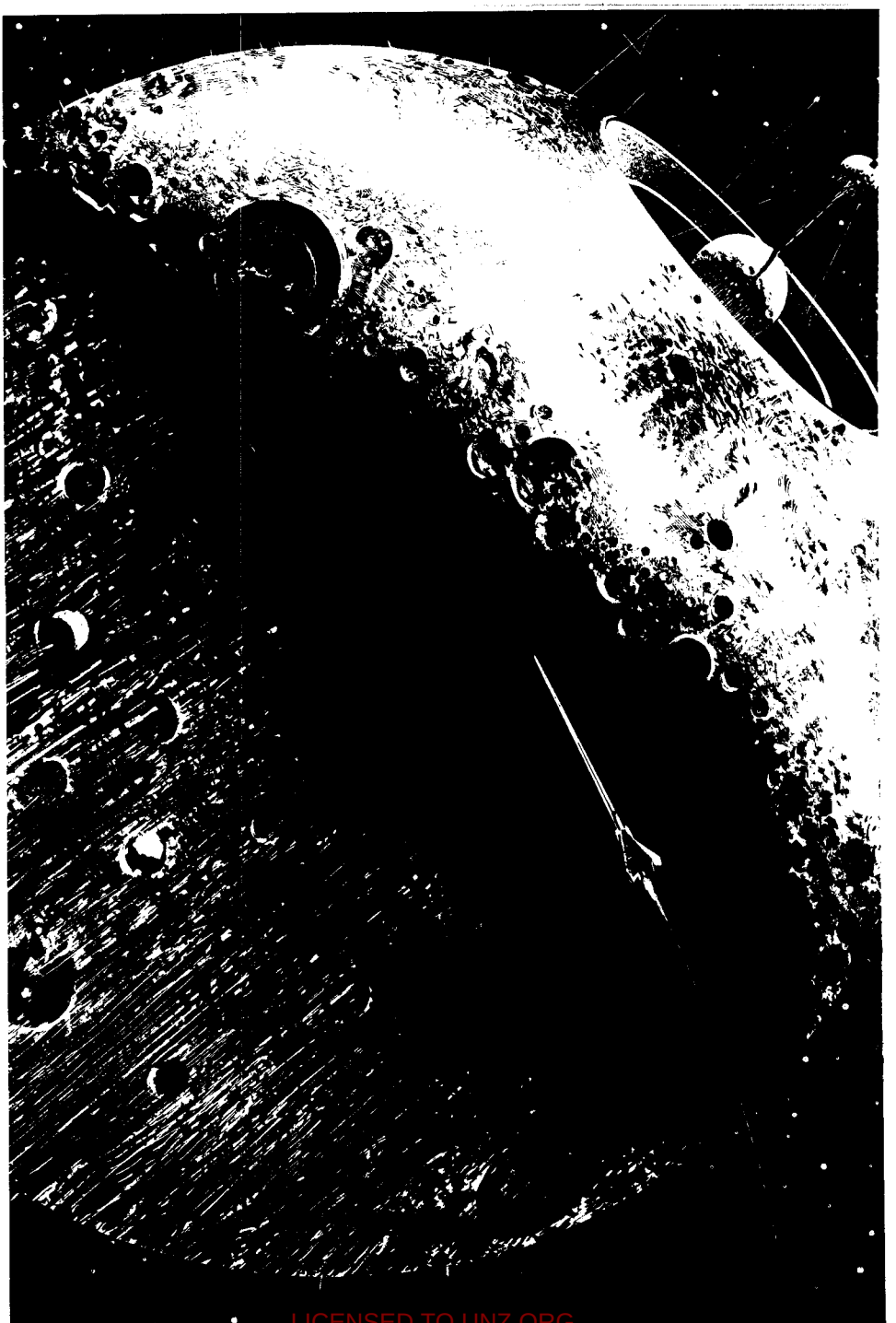

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panion is a red dwarf, lighter and only one twenty-fifth as luminous.

Dense, rust-red, and metal-poor, Cassiopeia-B keeps its distance from the bright partner. It never approaches closer than ten billion kilometers. Seen from the planets near Cass-A, the weak, rusted cinder of the companion appears far too feeble to have any influence. But the gravitational field is a long-range force. Gravitational effects of Cass-B had profound influence on the whole system. The planetary family that evolved around Eta Cassiopeiae is a whole zoo, with a bewildering variety of specimens.

Over fifty worlds reel and gyrate around the star pair. Their orbits are at all inclinations and eccentricities. The planets within a few hundred million kilometers of Cass-A exhibit orbital regularity and stable cycles, with well-defined orbital periods and near-circular orbits. But the outer worlds show no such uniformity. Some follow paths with both Cass-A and Cass-B as foci, and their years can last for many Earth centuries. Others, locked into resonances with both primaries, weave complicated curves through space, never repeating the pattern. Sometimes they will journey in lonely isolation, billions of kilometers from either star; sometimes they dip in close to the searing surface of Cass-A.

The travelers on *Eleanora* had concluded that a close encounter of a major planet was also the cause of the system's complexity. Millions of years earlier, a gas giant had come too close. It had skirted the very photosphere of Cass-A. First the volatile gases were evaporated away; then irresistible tidal forces caused disruption of the remaining core. The *ejecta* from that disintegration had been hurled in all directions, to become parts of the Fifty Worlds.

To the visitors approaching the system, the wild variations of the outer worlds at first seemed to dominate everything. The Cassiopeia binary complex was an unlikely candidate for human attention. Where orbits are wildly varying, life has no chance to develop. Changes are too extreme. Temperatures melt tin, then solidify nitrogen. If it is once established, life is persistent; it can adapt to many extremes. But there is a fragility in the original creation that calls for a long period of tightly-controlled variations.

The automated probes were sent out from *Eleanora*; but only because that was the procedure followed for many centuries. First returns confirmed an impression of scarred and barren worlds, bleak and empty of life. When the electronic reports were beamed back from the probe to Pentecost, they seemed just too good to be true. Here was a stable planetary orbit, close to circular, one hundred and ninety million kilometers from Cass-A. And Pentecost was a real Earth-analog, with native vegetation and animal life, acceptable temperatures, an eighteen degree axial tilt, twenty-two hour day, breathable atmosphere, forty percent ocean cover, a mass that was only ten percent less than Earth, and an orbital period only four percent longer than a standard Earth year.

It was hard to believe that Pentecost could exist amid the dizzying variations that comprised the Fifty Worlds. But the probes never lied. At last, after eons of

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travel between the stars, and endless disappointment, humanity had found a new home.

Chapter 15

The Fifty Worlds held enormous diversity. Peron knew that. They were of all sizes, shapes, orbits, and environments. No two seemed even remotely alike, not even the twins of the doublet planet of Dobelle. And most of them fit poorly anyone's idea of a desirable place to visit, still less as the site for another trial.

And as for Whirlygig . . .

Peron was approaching it now. He had to land there. Of all of them, he thought gloomily, this one has to be the most alien and baffling.

In the past two months the Planetfest winners had orbited over a dozen worlds. The planets had ranged from depressing to unspeakable. Barchan was a baking, swirling dust-ball, its surface forever invisible behind a scouring screen of wind-borne particles. They were held aloft by a thin, poisonous atmosphere. Gilby had warned them that Barchan would be a terrible choice for a trial (but he had said that about most places!). The dust and sand found its way into everything—including a ship's controls. There was a good chance that a landing on Barchan might be final.

Gimperstand was no better. The contestants had voted not even to look at it, after one of the ship's crew had produced a sample bottle of sap from Stinker's juicy vines. The bottle had been opened for less than two minutes. A full day later the air through the whole ship still *tasted* like rotting corpses. Air purifier units didn't even touch it.

From a distance, Glug had looked pretty good. The ship's telescopes and scanners showed a green, fertile world, ninety percent cloud-covered. They had actually made a field trip down there, and spent a couple of hours squelching and sticking on the viscous surface. A steady gray rain drifted endlessly down from an ash-dark sky, and the sodden fronds of vegetation all drooped mournfully to touch the gluey soil. Once a boot had been placed firmly, the planet acted as though reluctant ever to release it. It clung lovingly. Walking was a pained sequence of sucking, glutinous steps, dragging the foot upward inch by inch until it came free with a disgusting gurgle. As Wilmer had put it, once you had pulled your boot out you never wanted to put it back again—except that your *other* boot was steadily sinking in deeper.

Glug was revolting, but Peron thought it would still make the final list. Sy had even voted to make it his first choice! Maybe his complex thought processes had discovered something about Glug that could be turned to his advantage. Lum had pointed it out long ago to Peron and Kallen: Sy did not need an *edge* over others to win; all he needed was a situation that canceled the handicap of his withered arm. Given that, he would wipe the floor with all of them.

Some of the others had also cast a tentative vote in favor of Glug; for by the time the contestants went there they had already visited some choice specimens:

Boom-Boom—constant volcanic activity and earthquakes; an ambient noise level that seemed to shatter eardrums; foul, sulphurous air and treacherous ter-

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rain where fragile crusts of solidified lava stood above molten slag.

Firedance—only microscopic animal life, and at any time one sixth of the vegetation that covered the whole world was a smoldering, charred mass: the rest was bone-dry and ready to spring to blazing life after any random lightning stroke: ribbons of flame danced and crackled their twisting paths along the surface, changing direction unpredictably and moving far faster than a running human.

Fuzzball—every living thing, every plant or animal that lived under or on the surface, or in the salty seas of Fuzzball, served as a host to a single species of fungal growth. Evolutionary adaptation appeared complete so that the fungus did not harm; but its white, hair-fine tendrils sprouted from every inch of skin, and every animal's ears and nostrils carried their own harvest of delicate, trailing fronds; the prospect had been too much for the contestants, even though Gilby assured them that the fungus could be removed from them completely after leaving the planet. Fuzzball had received zero votes.

Goneagain sounded tolerable; but that little world had been ruled out by simple geometry. Its orbit was wildly eccentric, carrying it tens of billions of kilometers away from Cassay and Cassby. It would not return to the Inner System for another three thousand years.

And then there was Whirlygig. Peron peered ahead through the faceplate of his suit. Three hours to go, then he would be landing there—without a ship. Later (if all went according to plan) he would leave in the same way. Meanwhile, there was not a thing to be done until the moment of grazing impact was reached. Peron—not for the first time—wondered about his velocity calculation. He had checked it ten times, but if he were off by a few meters a second . . .

He resolutely turned his mind to their earlier travels, and struggled to put Whirlygig out of his thoughts for the next three hours.

There were plenty of other things to think about. For the first two weeks of the journey away from Pentecost, privacy had been impossible for all of them. The shuttle vessel was impressively big, but with thirty people squeezed into a space intended for three crew and cargo, the contestants had been shoulder to shoulder. Not until transfer to the big Inter-System ship, after a short visit to Little Moon, did they have room to spare. And at last Peron had been able to compare notes with the others.

By careful cross-checking that had taken them several days, Lum and Kallen had accounted for all the winners. Wilmer was the only bogus contestant. They had also confirmed Peron's first impression: no one had been with Wilmer in any trial, and he had been suspiciously fresh after all of them. But the reason for his presence among them? No ideas from anyone. And to add to the mystery, Wilmer certainly *had* been with them on all the activities since they lifted off from Pentecost—which had sometimes been dangerous, as well as unpleasant.

Wilmer's innocent request to Gilby that they be allowed to visit The Ship, along with Gilby's answer, had registered on both Peron and Elissa. Someone wanted the winners to know that

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The Ship was off-limits. But again, what did it *mean?* How was it connected with the fact that some previous winners of the Planetfest games had not returned to Pentecost?

Peron had bounced the questions off Sy, when they had a few minutes of privacy in the Inter-System ship. Sy had stood motionless, his eyes aloof.

"I don't know why The Ship is off-limits," he said at last. "But I agree with you that Gilby was prompted to tell us that. Let me tell you of a bigger mystery. After the off-planet trials the Immortals will supposedly appear. We are told that they will come from the stars, after a journey that will take just a few days. Do you believe that?"

"I don't know." Sy's question was voicing one of Peron's own worries. "If it is possible to travel faster than light, our theories of the nature of the universe must be wrong."

"That is *possible,*" said Sy slowly —with a tone of voice that said clearly, that is quite impossible. "But don't you see the problem? If the Immortals can exceed light-speed, they must have improved on our theories. And if they are so friendly to us, why do they keep that better theory from us?"

Peron had shaken his head. Anything about the Immortals remained a mystery.

"It is my personal belief that nothing can exceed light-speed," said Sy at last. "I will mistrust anyone, Government or Immortal, man or woman, human or alien, who attempts to tell me otherwise without providing convincing evidence."

And he had moved quietly away, leaving Peron more puzzled than ever. Conversation with Sy often left that unsettling feeling. Lum had explained it in his offhand way—Sy was just a whole lot smarter than the rest of them. And Elissa had thrown in her own evaluation: Sy was not *smarter*, not if that meant either memory or speed of thought; but he could somehow see problems from a different angle from everyone else, almost as though he were located at a different point in space. His perspective was different, and so his answers were always surprising.

And if he weren't so strange, she had then added irrelevantly to Peron, he would be really attractive; which had of course irritated Peron greatly.

His thoughts moved inevitably back to Elissa and their last night on Pentecost. While Lum and Kallen had been working conscientiously to screen contestants, Peron had been subjected to a pleasant but intense cross-examination. He and Elissa had found a quiet place in the Planetfest gardens. They stretched out on the soft ground cover and stared up at the stars, and Elissa must have asked him a thousand questions. Did he have brothers and sisters? What was his family like? Were they rich? (Peron had laughed at the idea that his father could ever be rich.) What were his hobbies? His favorite foods? Did he have any pets back home? Had he ever been on a ship, across one of Pentecost's salt-water seas? What was his birthdate? *Do you have a girl friend, back in Turcanta?*

No, Peron had said promptly. But then his conscience had troubled him, and he told Elissa the truth. He and Sabrina had been very close for two years, until he had to devote all his time to

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preparation for the trials. Then she had found someone else.

Elissa didn't bother to disguise her satisfaction. She had quietly taken hold of Peron and begun to make love to him.

"I told you I was pushy," she said. "And you were acting as though you'd never get round to it. Come on—unless you don't want me? I've wanted to do this—and especially *this*—ever since I met you on the forest trial, back in Villasylvia."

They had done things together that Peron had never imagined—and he used to think that he and Sabrina had tried everything. Lovemaking with Elissa added a whole new dimension. They had stayed together through the night, while the fireworks of Planetfest celebrations fountained and burst above them. And by morning they seemed infinitely close, like two people who had been lovers for many months.

But that, thought Peron unhappily, made Elissa's comment about Sy much harder to take. If she thought Sy was attractive—hadn't she said *very* attractive?—did that mean she thought Sy was more interesting than he was? He remembered the last evening on Pentecost as fabulous, but maybe she didn't feel the same way. Except that everything since then suggested that she *did* feel that way, and why would she lie to him?

Peron's suit gave a gentle whistle, bringing him back from his dreaming. He felt irritated with his own train of thought. No denying it, he was feeling *jealous*. It was exactly the kind of mindless romantic mushiness that he despised, the sort of thing for which he had so teased Miria, his younger sister.

He looked straight ahead. No time for dreaming now. Here came Whirlygig, to teach him a lesson in straight thinking. He was within a couple of kilometers of the surface, traveling almost parallel to it but closing too fast for comfort.

Seen through a telescope, Whirlygig was not an interesting object. It was a polished silver ball about two thousand kilometers across, slightly oblate and roughened at the equator. Its high density gave a surface gravity at the poles of a fifth of a g, a bit more than Earth's Moon. A person in a spacesuit, free-falling straight down to the surface of Whirlygig, would hit at a speed of two kilometers a second—fast enough that the object in the suit afterward would hardly be recognizable as human.

But that was true for a fall toward any planet in the system, and people did not attempt landings on objects of planetary size without a ship; and the composition of Whirlygig was of no particular interest. The planet had been ignored for a long time, until finally some astronomer took the trouble to examine its rotation rate.

Then interest grew rapidly. Whirlygig was unique. What made it so had happened recently, as geological time is measured. A mere hundred thousand years ago a close planetary encounter had transferred to the body an anomalously high angular momentum. After that event Whirlygig was left spinning madly on its axis, completing a full rotation in only seventy-three minutes. And at that speed, centripetal acceleration on the equator just matched gravitational force. A ship flying in a trajectory that grazed Whirlygig's sur-

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face, moving at 1,400 meters per second at closest approach, could soft-land on the planetoid with no impact at all; and a human in a suit, with only the slightest assistance of suit steering jets, could do the same.

But theory and practice, thought Peron, were a long way apart. It was one thing to sit and discuss the problem on the Inter-System ship with the other contestants, and quite another to be racing in toward Whirlygig on a tangential trajectory.

They had drawn lots to see who would be first contestant down. Peron had "won"—Gilby's term, delivered with a sadistic smile. The others, following in pairs, would face a far easier task because of Peron's actions of the next few minutes. *If* he arrived in one piece.

He wondered what they would do if he *didn't* land safely—would they nominate someone else to try again? Or would they abandon the whole idea, and move on to another planet? A contestant in theory had just one shot at the trials (Kallen was a rare exception). But death was an earnest contender in every Planetfest games. The deaths of contestants were never mentioned by the Government, and never given one word of publicity in the controled news media; but everyone who entered the trials knew the truth. Not everyone went home a winner, or even a loser. Some contestants went forever into the shimmering heat of Talimantor Desert, or to a blood-lapped nightdeath in the woods of Villasylvia, or to a frozen tomb in the eternal snows of Capandor Mountains; or (Peron's own secret fear) to a slow asphyxiation in the underwater caverns of Charant River.

He shivered, and peered ahead. Those dangers were past, but death had not been left behind on Pentecost. He would visit Peron just as readily on Whirlygig. The equipment that Peron was hauling along behind him had seemed small when he left the ship, but now four hundred kilos of lines, springs, and pitons felt like a mountain, trailing half a kilometer directly behind him. Uncontrolled, they would envelop him on landing.

The surface felt so close that it seemed he could reach out a suited arm and touch it. He made small attitude adjustments with the suit jets. His velocity was just right for a stable orbit about Whirlygig at surface level. He turned his suit to land feet-first, and touched, gently as a kiss.

He had landed softly, but at once there was a complication. He found he was at the center of a blinding cloud of dust, pebbles, and rock fragments. Effective gravity here on Whirlygig's equator was near to zero, and the shower of rock and sand was in no hurry to settle or disperse. Working purely by touch, Peron took one of the two pitons he was carrying, placed it vertically on the surface, and primed the charge. His hands were shaking in the gloves. *Must be quick*. Only thirty seconds left to secure a firm hold. Then he would have to be ready for the equipment.

The explosive charge in the top end of the piton exploded, driving the sharp point deep into the planet's surface. Peron tugged it briefly, made sure it was secure, then for double safety primed and set off the second piton. He braced

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two loops on his suit around the pitons, and looked back toward the moving bundles of equipment.

It seemed impossible. The equipment was still a couple of hundred meters away. The whole landing operation —minutes according to his mental clock—must have been completed in just a few seconds. He had time to examine the bundle of equipment closely, and decide just where he would secure it.

It swung in toward him, drifting down toward the surface. The velocity match had been exact. It was less than five minutes work to place another array of pitons in a parabolic curve along the surface, and set up catapult cables to run around the array. The final web of cables and springs looked fragile, but it would hold and secure anything with less than three hundred meters a second of relative velocity.

Peron made one last examination of his work, then activated the suit phone.

"All set." He hoped his voice was as casual as he would have liked it to be. "Come on in anytime. The catapult is in position."

He took a deep breath. *Halfway.* When they had explored the surface as a group, the catapult would be used to launch all the others away from Whirlygig; and Peron would be alone again. Then he would make a powered ascent (with fingers crossed) to the safety of the waiting ship.

Chapter 16

Peron could not recall the exact moment when he knew that he was going to die on Whirlygig. The knowledge had grown exponentially, over perhaps a minute, as his mind rapidly ran through every possible escape and rejected all of them as impossible. Cold certainty had finally replaced hope.

The landing had gone almost perfectly, as the six other contestants assigned to visit Whirlygig sailed in to a smooth encounter with the landing web. Wilmer, paired with Kallen, had proved the exception. He had come barreling in too fast and too high, and only Kallen's hefty pull on their line had brought him low enough to connect with the cables.

He seemed not at all upset by his narrow escape. "Guess you were right, Kallen," he said cheerfully, once he was safely down. "Odd, that. I'd have bet money I had the speed accurate and you had it wrong."

"Be thankful you weren't first man in," said Rosanne severely—she had seen how close Kallen had been to losing his own hold. "If Peron had done that he'd have been in big trouble. And what do you have in *there?* That's probably the mass you didn't allow for in your calculations."

Wilmer held up a green case. "In this? Food. I didn't know how long we'd be here. I've no wish to starve, even if you all don't mind it. And if I *had* been first one in, Rosanne, with my trajectory I'd also have been first one out. At that speed and height I'd have missed Whirlygig altogether. There's a moral in that: better come in too high and fast than low and slow."

He had begun to hop gingerly from one foot to the other, testing his balance. The effective gravity on Whirlygig's equator was not exactly zero, but it was so slight that a tumbling upward leap

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of hundreds of feet was trivially easy. Everyone had tried it, and soon lost interest. It took minutes for the feather-light float down back to the surface, and one experience of that was enough.

They soon began the careful trek away from Whirlygig's equator, traveling in small groups and heading for the comforting gravity of the polar regions. Only Sy was left behind, making his own solitary and perplexing experiments in motion over the rough terrain.

Progress for everyone was slower than expected. They could fly low over the surface with little effort, using the tiny propulsive units flown in after they were all landed. But Whirlygig's rapid rotation made Coriolis forces a real factor to reckon with, and allowing for them called for constant adjustment to the flight line. The suit computers refused to accept and track a simple north reckoning, and it was easy to stray twenty or thirty degrees off course. After they had been on the way for a couple of hours, Sy caught up and quickly passed them all. He had discovered his own prescription for estimating and compensating for Coriolis effects.

As they flew north the appearance of the land below gradually changed. The equator was all broken, massive rocks, heaped into improbable, gravity-defying arches, spires, and buttresses. A few hundred kilometers farther toward the pole the terrain began to smooth, settling down into a flatter wilderness of rugged boulders. It was not a pleasant landscape, and the temperature was cold enough to freeze mercury. But compared with some of the other worlds, Whirlygig seemed like vacation-land.

The suits had efficient recycling systems, and ample food supplies. The contestants agreed to carry on right to the pole, then rest there for a few hours before returning to the equator and leaving. According to Gilby they would find a sizeable research dome at the North Pole, where they would be able to sleep in comfort and remove suits for a few hours. All scientific surveys on Whirlygig had been completed many years earlier, but the dome facilities should still be in working order.

Elissa and Peron had chosen to travel side by side, with their radios set for private conversation. The suit computers would monitor incoming messages and interrupt for anything urgent. Elissa was bubbling over with high spirits and cheerfulness.

"Lots of thing to tell you," she said. "I didn't have a chance to talk to you yesterday, you were too busy getting ready for the landing here. But I've spent a lot of time making friends with one of the crew members—Tolider, the short-haired one with the pet tardy."

"That hadn't escaped my attention," said Peron drily. "I saw you petting it and pretending you liked it, too. Disgusting. Why would anybody want a big, fat, hairy pet worm?"

Elissa laughed. "If I were to tell you what some people want with it, I'd shock your innocent soul. But Tolider just likes it for company, and he looks after it well. Love me, love my tardy, that's what he seems to think. Once he thought I was a tardy-lover, too, he was ready to bare his soul. Now, are you going to spend the next few hours sounding jealous, or do you want to know what he said?"

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"Oh, all right." Peron's curiosity was too great to allow him to maintain an aloof tone, and he knew from his own experience how good Elissa was at winkling information out of anyone. "What did he tell you?"

"After he felt comfortable with me we talked about the Immortals. He says they aren't a hoax, or something invented by the government. And they aren't human, or alien, either. He says they are *machines.*"

"How does he know?"

"He saw them. He's been working in space for over twenty years, and he remembers the last time the Immortals came. He said something else, too, once I'd softened him up—shut up, Peron—something that he says the government doesn't want anyone down on Pentecost ever to know. He told me because he wanted to warn me, because he feels sorry for me. He says that some of the winners of the Planetfest games who go off-planet are sacrifices to the Immortals. They—that means us—will become machines, themselves."

"Rubbish!"

"I agree, it sounds like it. But he made a lot of good points. You hear about the Immortals, but you never hear a description of one—no stories that they're just like us, or that they're big or little, or have green hair, or six arms. And you tell me: what *does* happen to Planetfest winners when they go off-planet?"

"You know I can't answer that. But we've seen videos of them, after they won the games. How could that happen if they had been converted to machines?"

"I'll tell you what Tolider says—and this is supposed to be common rumor through the whole space division. It's like an old legend that goes back to the time we were first contacted by the Immortals. We know that the computer records on The Ship were destroyed, but there's no real doubt that it left Sol over twenty thousand years ago, and traveled around in space until five thousand years ago when it found Pentecost."

"No one will argue with that, except maybe your old aunt who thinks we've been on Pentecost forever. We were even taught it in school."

"But the old records say that everything on Earth was wiped out, and everyone died in the Great Wars. Suppose that's not true—partly true, but exaggerated. Suppose there were enough people left to start over again, says Tolider, and suppose they survived the bombs and the Long Winter. They wouldn't be starting from scratch, the way we began on Pentecost. They'd be able to breed back quickly—it took us less than five thousand years to grow from The Ship's people to over a billion. Earth would have had at least fifteen thousand years to develop their technology, beyond anything we can imagine, while we were wandering round on The Ship, looking for a home. They would have machines hundreds of generations better than our best computers. Maybe they would have reached the point where the dividing line between organic and inorganic would be blurred. We definitely know they have better computers—did you realize that the Immortals, not Pentecost, control space travel through the Cass system, because their computerized tracking system is enormously better than ours? Sy told me

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that, and he got it from Gilby. Anyway, that's what Tolider believes: The Immortals are intelligent computers, maybe with biological components, sent here from Earth. There. You're the smart one—so find a hole in that logic."

They flew along in silence as Peron thought it over.

"I don't need to find a logical gap," he said at last. "Tolider's story doesn't fail on logical grounds, it fails on sense. People do things for *reasons*. If Earth had recovered and gone back to space, they might have sent ships out to look for us, sure—and for the other ships that supposedly left at the same time we did. Suppose that's true, and suppose they eventually found us. Then they'd come and tell us we had been discovered. Why would they ever *not* want to tell us? Tolider is repeating old stories. Nothing wrong with that, but you don't expect legends to make sense. Let me ask *you* a question that doesn't depend on myths for an answer. Supposedly we get scientific information from the Immortals, and they drop off a new batch of ideas every twenty years, along with a few rare materials that are in short supply in the Cass system. Right?"

"I think that's definitely true. Tolider says he has actually been involved in the materials transfer. He also says that the government down on Pentecost is obsessed with control and maintaining the status quo, and that they use new technology to remain in power. That's why we've had a stable, single regime every since we were contacted by the Immortals, and that's one reason he prefers to stay out in space where there's more freedom."

"He should meet my father—he's been saying for years that the government is run by a bunch of repressive tyrants. But don't you see the problem? The Immortals give us things, and it's a one-way transfer. Nobody, not even a machine, will stand for a one-way trade for four hundred and fifty years. If all they wanted to do was give us information, they could do that using radio signals. But they actually come here. So here's my question: What do the Immortals get from their visits to Pentecost?"

"Some of *us*, if you want to believe Tolider. You and me, that's what the government trades to get new information."

"That makes even less sense if we want to believe Tolider. We winners are a talented group, but we're not *that* special. If Earth had been repopulated to the point where they could explore the stars again, they'd have thousands like us."

"Tolider told me that we *are* an unusual group," she said. "Rumor says it's the first time for many games that all the top five in the Planetfest games are 'troublemakers'—he couldn't define the term for me."

"I think I can. We won't take answers without digging for ourselves. That's one reason I feel so comfortable with the rest of you."

"I'll accept that. So let me point out one other thing. You can tell me what it means. The contestant groups for surface visits to Glug and Bedlam and Crater and Camel and the other planets were all some random mixture of all twenty-five winners. But look who's here on Whirlygig: Sy, me, you, Kallen, and Lum—the top five, all 'troublemakers,'

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plus Rosanne and Wilmer. I think Rosanne would be classed as a wild one, too, difficult to control—your hair would curl if I told you some of the things she's done. And we all wonder about Wilmer. We've been specially *picked* for this trip, and I'm worried about what might happen here."

Peron moved their suits closer together so that he could see her face. He realized she was genuinely worried, not just joking. He reached across to take her suit glove. "Relax, Elissa. You're as bad as Tolider, all wild surmises. They wouldn't bring us all this way to dispose of us on Whirlygig. If we are that much nuisance we could have been chucked out of the contest back on Pentecost, and nobody would ever have suspected a thing." He laughed. "Don't worry. Now we've landed we're safe enough on Whirlygig."

They had made good progress. The North Pole would soon be in sight. And in less than an hour, Peron would know the falseness of his final words.

The dome was a hemisphere of tough, flexible polymer, roughly twenty meters across. It was located on the exact axis of rotation of the planet. That axis was highly tilted to Whirlygig's orbit plane, so at this time of the year the golden sun of Cassay was permanently invisible, hovering down over the other pole. Only the weak companion, Cassby, threw its ruddy glow across the landscape, providing adequate light but little heat. There were no free volatiles on Whirlygig, but the surface temperature at polar midwinter would be cold enough to liquefy methane.

Peron and Elissa had been too engrossed in their conversation to make the best speed from the equator, and they arrived last. The others were already landed, clustered around the dome. Sy, Lum, and Rosanne were inspecting the entry air-lock, without touching any part of the door. Kallen and Wilmer were around the back, on the opposite side of the dome, looking at something on the wall.

Elissa stepped close to see what Sy was doing. "Problems?"

Lum turned and nodded. "Wondered when you two would get here. Problems. Maybe we won't have a pleasant night out of our suits after all."

Sy was still crouched over by the door. He seemed rather pleased to be faced with the new challenge.

"See, here's how it's *supposed* to work," he said. "There's an air-lock with an inner and outer door. The outer door, this one here, has a fail-safe on it, so it won't open when there's any gas pressure in the air-lock. First you have to pump out the lock to near vacuum, and you can do it from outside. That's this control, on the outside wall. When we arrived, there was atmosphere in the airlock, so naturally it wouldn't open. We pumped it out—the pumps work fine—but it *still* won't open."

"Motor failure?" asked Peron.

"Could be. The next step is to try to open it manually. But we want to be sure we know what we're doing. Over on the other side of the dome there's a big patch of black sealant. Suggests there was a meteor impact, and the self-repairing system took care of it. But we don't know what that may have done to the inside until we get there. And we don't know how much damage the me-

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chanical systems may have suffered. Maybe the meteor hit the lock, too. We'll have to get in and find out."

Peron stepped forward to peer at the door. It appeared quite intact. "You're sure there's no pressure now in the air-lock?"

"Positive. The guage there is working. It showed positive pressure when we arrived, and as we pumped it went down to zero."

"So it should be safe enough to open manually," added Lum. "We were preparing to do that when you two arrived. Come on, another pair of hands may help a lot."

The outer door of the lock gave grudgingly, as Sy, Lum, and Peron *jerked hard at it. Finally it was about* halfway open, almost enough to admit a person.

"My turn now," said Rosanne. "I couldn't be much use in the tugging and heaving part, but I'm thin enough to get in there where you fatties can't, and see what's going on. Give me room."

She came to the lock door, turned sideways, and began to crab carefully into the opening.

Peron was standing just behind her. He heard Sy's warning yell at the same moment as the thought came into his own head. *Idiots! If we know the outer door isn't working right, why assume that the controls for the inner one are any better?*

He leaned forward, took Rosanne around the waist and with one movement propelled her back and sideways, away from the open outer door of the lock. He heard a gasp of surprise and annoyance over her radio as Rosanne skittered away across the silver-and-brown surface. Then before he could follow her, a great force took him and drove him end-over-end across the jagged rocks.

Even as he was jerked and battered inside his suit, his own thoughts remained quite clear. The inner door seal must have been already broken, ready to fail and hanging on a thread. So long as there was an equalizing pressure in air-lock and dome, there was no problem. But once they had pumped down the pressure in the lock, the inner door had tons of air pressure exerted upon it. If it failed, all the dome's gases would be released in one giant blow-out through the lock. And for anyone standing in the way . . .

Peron was spinning and ricocheting from one rock formation to the next. He felt three separate and shattering collisions, one on the chest, one on the head, and one across his hip. Then, quite suddenly, it was over. He was lying supine on the surface, staring at the ruby orb of Cassby and surprised to find that he was still alive.

The others came crowding round him, helping him to his feet. He was amazed to see that he was almost fifty meters away from the dome. Rosanne had picked herself up and was waving to show that she was all right.

"I'm all right, too," said Peron.

There was a long, strange silence from the others. At last Peron noticed a faint, ominous chill on the lower left side of his abdomen. He looked down. His suit there was dreadfully buckled and splintered from chest to thighs, and over his abdomen it showed white instead of the usual metallic gray.

"Air supply working, but he's lost

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two tanks." That was Lum, his voice oddly distorted, from behind him. The suit radio had taken a beating, but it still functioned after a fashion.

"No problem, he can share ours."

"Motor controls look all right."

"Food containers gone."

"We can cover for that."

"Oh-oh. Thermal system is out. And most of the suit insulation is stripped from the lower torso."

"That's a worse problem."

His radio's distortion was so bad that Peron found it hard to identify the speakers. He cut to a privacy mode. While they inspected the condition of his equipment, his own mind raced on ahead of them.

Evaluate the options.

Think!

Fourteen hours back to the equator—say that could be shaved to ten hours at maximum speed. A few minutes in the launch catapult, then another six or seven hours to ship rendezvous. Hopeless. Even with full insulation, in these temperatures the suit would protect him for only three or four hours. He'd be dead of hypothermia long before he reached the equator.

Change to a new suit? There was none. They carried spare parts for small suit components, but not for the whole thing.

Think. Bundle him into something that would keep him warm for a long time? Fine—but what? There was nothing.

Take him into the dome, replace the lost atmosphere from tanks, and raise the temperature? Maybe. They could get air in there in less than an hour. But they couldn't generate heat fast enough. He would be able to breathe, and still he'd freeze to death.

Signal for an emergency landing at the pole of Whirlygig by a small ship? It was probably the best hope—but still too slow. Say three or four hours to prepare, then another three before it arrived here. By then Peron would be an icy corpse.

Other ideas? He could find none. His mind ran on, writing its own obituary: Peron of Turcanta, twenty years old, who survived the dunes of Talimantor Desert, the nightwoods of Villasylvia, the Hendrack Maze, the water caverns of Charant, the Capandor glaciers, the abyssal depths of the Lackro Trench . . . who had lived on, to freeze on Whirlygig. His name would be added to that list of names that the government never mentioned, the unfortunates who died in the off-planet final trials of the Planetfest games.

Peron turned his suit back to general receiving mode.

"We're agreed, then," a clear voice was saying. "Nothing any of us can think of would do it in time?"

The distortion of the damaged radio changed the tone of the voice. Peron came back from his own somber thoughts, and found to his surprise that the speaker was Wilmer.

"Looks that way." That was obviously Lum speaking. "We called the ship and they'll have something on the way as soon as they can, but it will probably be eight hours. Sy did a rough heat loss estimate from the condition of the suit, and calculates that we have a couple of hours to do something—three at the outside."

"Damnation."

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My thoughts exactly, said Peron to himself calmly. Damnation. But what's happening to Wilmer? After tagging along as a good-natured mystery and non-contestant through all the games, he's suddenly the dominant figure of the group. The others are actually deferring to him, letting him control them.

Peron had a sudden insight. It was simple shock. Shock had overwhelmed all of them; but somehow Wilmer and he, Peron, the source of all the concern and the one who was condemned to die, could distance themselves from the emotion. He caught sight of Elissa's horrified face through the faceplate of her suit, and gave her an encouraging smile. Kallen had tears in his eyes, and even Sy had lost that remote look of calm confidence.

"No other ideas?" went on Wilmer. "Right. Give me a hand. Peron, I want to talk to you. The rest of you, I want an atmosphere inside the dome as soon as you can get it. Don't worry about the temperature. I know it will be low and we can handle that."

He was opening the green equipment sack that he had carried with him down to Whirlygig, and examining the array of ampoules, syringes, and electronic tools that lay in neat rows within it. After one long, startled look Sy headed for the dome, but the others stood motionless until Lum's roar: "Let's get to it." As he left he turned to Wilmer, his great hands clenched in their suit gloves. "This is no time to talk, but you'd better know what you're doing. If you don't I'll personally skin you alive when we get back to the ship."

Wilmer didn't bother to answer. Behind the faceplate his face was set in a scowl of concentration.

"Private circuit. You and I have to talk for a couple of minutes," he said to Peron, and waited until the personal suit frequency was confirmed. "All right. How do you rate your chances?"

"As zero."

"Fine. We'll be starting off without any delusions. I assume you're ready to take a risk?"

Peron felt like laughing. "You mean, one that gives me less chance of survival than I have now?"

"A fair answer. I know exactly what I'm going to try to do, but I've never tried it under circumstances remotely like these. I've got the drugs I need, and the environment in the dome won't be too far from the lab conditions. All right?"

"I have absolutely no idea what you are talking about."

"And I don't have the time to explain. Never mind. First, I'm going to give you an injection. It will have to go right in through your suit, but I think the needle will take it and the self-sealing will take care of the puncture. After that we'll get you inside. I think the shoulder seal is best."

Before Peron had time to object Wilmer had moved to his side, and he felt the sharp sting of a needle in his left trapezius muscle.

"Now we have less than a minute before you'll begin to feel dizzy." Wilmer had thrown the hypodermic away and was taking another one from his case. "Listen closely. I want you to crack all the suit seals so we can easily take it off you when you're unconscious. Don't talk, and just try to go on

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breathing as shallowly as you can. When you feel you are going under, don't try to fight it. Let it happen. All right?''

The chilly area in the center of his stomach was spreading rapidly to engulf his whole torso. At the same time he had the feeling that the horizon of Whirlygig was retreating steadily from him, becoming farther and farther away. He nodded to Wilmer, and manipulated the control that transferred all suit seals to external access. His own breathing felt harsh and rapid, and he struggled to inhale and exhale slowly and steadily.

''Good man. Sorry I don't have time to explain, but I've never heard of this situation happening before. I'll probably get slaughtered when they find out what I'm trying to do. But you're lucky. I was in bad trouble myself on Whirlygig once, over three hundred years ago. And I remember how I felt.'' Wilmer gripped his hand. ''Good luck, Peron. If you wake up again you'll be over in S-space.''

In S-space. If I survive, there'll be one mystery explained, thought Peron. He returned Wilmer's grip.

''I'll need help,'' said Wilmer. He was back on open circuit. ''We have to get Peron out of that suit as soon as the pressure will let us. And he'll be unconscious. Elissa, will you organize the fastest way to do that?''

Peron felt an overpowering and irrational urge to laugh. Wilmer, said a voice inside him, my odd and hairless friend, how you've changed. You were an old tardy-worm down on Pentecost, and now you're transformed into a golden-winged butterfly of authority. Or do I mean a *plant*, a rare exotic form that only blooms when it's off-planet? That question was suddenly important, but he knew he could not provide an answer.

Control had gone. He knew they were at the dome and ready to go inside it, but he could no longer see the door of the lock. Or the stars, or even the ground he stood upon. The scene before him was blinking out, bit by bit. It was like a great jigsaw puzzle, where every piece was black. All he could see was Wilmer, still holding his arm.

So. This is what it's like to die. Not too bad, really. Not bad at all.

The final piece of the puzzle was placed in position. Wilmer disappeared, and the whole world was black. ■

CONTINUED IN NEXT ISSUE

● Any fully matured science of ecology will have to grapple with the fact that from the ecological point of view, man is one of those animals which is in danger from its too successful participation in the struggle for existence.

Joseph Wood Krutch

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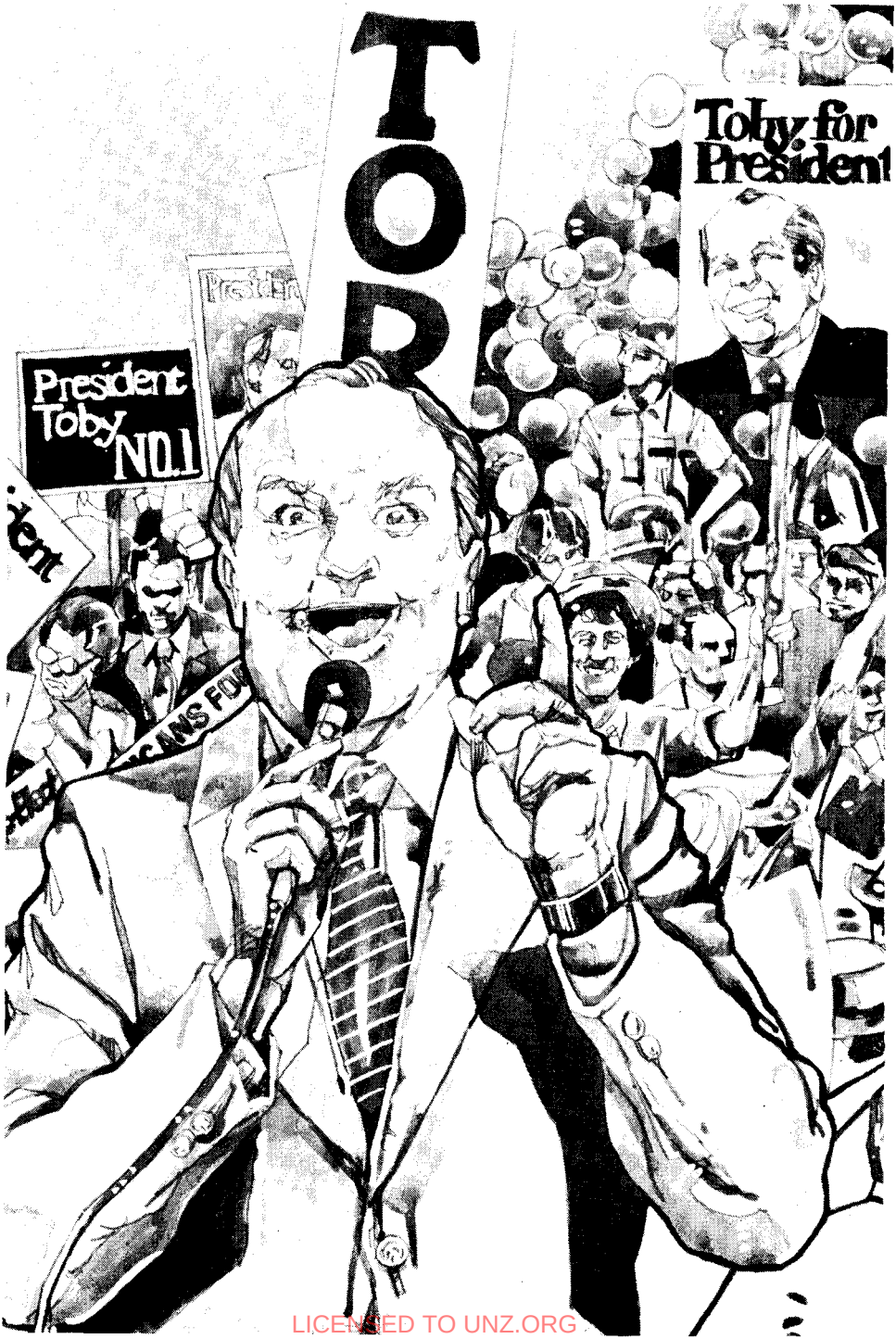

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Most of us think we know
the power of the media in politics.
But do we really?

Rick Shelley

BUT FIRST A MESSAGE....

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"Do you ever get the feeling that elections don't change anything?"

It started that simply, just another line in the monologue. Toby sat perched against the front of his desk and read it from the teleprompter.

"Lately," he continued, "you can't tell the players without a program, and half the time, the program's wrong.

"Just look at the current Presidential campaign, if you're not sick of it already. We started out, more than a year ago, with more than a dozen candidates, right?

"Except for minor variations, they all said the same thing. The President has made a royal mess of the country. I can fix it and nobody else can, right?

"But we get the same thing every four years. We give our politicians a chance to exercise their messiah complexes, and then we choose one of them as our President. But what do we get after the election? Electoral amnesia. The winner does whatever he wants to do. When we ask about the promises he made before the election, all we get is, 'What I really meant was . . .' and a line of bull. Right?

"It's hard to find anything new in Washington. Even the excuses don't show any originality. Only the faces are changed, to protect the guilty, right?"

Toby was on a roll. The monologue was going much better than it deserved. The audience was screaming back their "Right"s on cue. The elections were four weeks away and there was magic in the studio. Or maybe it just seems that way now. "The Toby Francis Show" was in its third year. Our ratings were fantastic. The show could go on forever.

We were a lot more secure than we had been at the beginning.

The network had used "The Toby Francis Show" as an emergency replacement during the changeover to full 3-D holovision. We were the proverbial finger in the dike of corporate disaster. The network had only gone into holovision half-heartedly, while the competition went 100% that year. The new season was a disaster before the end of premiere week. The network was running a poor third in the ratings wars and, in some markets, it was running behind educational and independent stations. Heads were already tumbling from the corporate totem. The network was desperate to get new holovision shows on the air, and it takes time to develop action or comedy series. Talk shows, game shows, and sports were easiest.

Toby Francis had years of experience on the night club circuit. He was so popular in Las Vegas and Tahoe that he kept homes in both places. He had appeared as a guest on most of the older talk shows and he had acted in several short-lived sitcoms. For the past five years he had hosted a morning talk show in Los Angeles. I'd been his announcer on that show and he brought me with him to the network.

We were supposed to run once a week, Wednesday at eight, but before our first show aired, the network dumped the same slot Friday on us. Two months later, we picked up Monday. We were expected to sink quickly and quietly. The network just wanted time to recover from its mistakes. But Toby caught on, despite the lack of network confidence or support, early format problems, and

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sadistic reviews. The critics panned everything. Some even chose to ridicule Toby's appearance. They refused to consider the possibility that a five-four, nearsighted, overweight, balding comic could sustain the show. The Hollywood seers unanimously predicted both comic and cosmic disaster.

People watched us anyway. Our ratings were never bad. After a month, we were in the top half. By the end of the second month, we were hitting the top ten about half the time. The network brass renegotiated our contracts, started treating us politely, and used their new shows in other slots.

Three years later, we were an established hit. On Wednesday, October 12, Toby finished his monologue on politics. During the commercial break, some people in the audience started chanting, "Toby Francis for President."

Toby's reaction was funnier than the monologue. He was shocked. His jaw sagged and his eyes bugged out. That was no act. When more voices started to chant, I had to laugh. Toby's look was so funny. By the time we went back on the air, half the audience was involved. Toby laughed for the cameras, but he was forcing it. He turned to me and said, "I don't believe it."

The audience stopped chanting when Toby started talking.

I shrugged. "They seem to believe it," I said, gesturing toward the studio audience. That rated a round of applause and cheers.

"Did you ever fantasize about what changes you'd make if you were President?" Toby asked me, mainly to prevent any renewed chanting.

I tried to keep it light. That was part of my job.

"Well," I said, slowly, as if I was considering my words, "for one thing, I'd be sitting behind the desk and you'd be over here." That got a nice laugh and we went on with the show. I thought that was the end.

It wasn't.

"Let's run with the gag while it's hot," Ken Banding, our producer, suggested after the show.

"I don't know," Toby said, hedging.

"It's a great idea," Ken insisted. "We've never had anything this good dumped in our laps before."

"I feel spooky about it," Toby said. "I can't believe how queasy that cheering made me feel. Like a kid out on his first date. Besides, we don't need it."

"It can't hurt," Ken countered. "Let's see what kind of reaction we get. If there's no significant negative feedback, we run a full-blown campaign —'Toby Francis for President.' "

"Ken."

"Strictly for laughs."

"Bill?" Toby asked, turning to me for support. That's part of my job too, but I had to hedge.

"It's been done before, but we might not have any choice."

"What do you mean?"

"We could have more chanting. An audience might even get out of hand." Ken nodded. Toby looked kind of sick. "Maybe we should run it into the ground. It'll get old soon enough."

Toby still wasn't happy. He finished his drink and started pacing around the

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office. Ken and I waited for his decision.

"I'll sleep on it," Toby said. "Let you know tomorrow."

That night, I watched a tape of the show when I got home. That gives me a better idea of how it went than I can get while we're on. Toby came out and perched himself against the desk, and it was almost as if he were right in the bedroom with my wife and me, joking about Washington. I heard the audience reaction, and I saw Toby's reaction after the commercial.

I didn't understand it, but I could feel the excitement. It left me with a spooky feeling too.

Toby gave in early Thursday afternoon. He called Ken and Ken passed the news to me. Our writers were already working with the idea. *They* liked it. When Toby got his rough script Friday morning, he grimaced but didn't complain. Maybe he hoped for a quick disaster. We could survive that.

By air time, Toby had hidden his apprehensions and slipped into his usual stage nonchalance. We had a good audience. They wanted to laugh, so the warm-up was easy—a few jokes we couldn't use on the air and we were ready. After a drum roll, I read a special introduction and we were on.

"Live from the campaign headquarters of the Laughter Party of America, this is 'The Toby Francis Show,' and here he is, the people's candidate, Toby Francis."

Toby strutted out carrying an "Uncle Sam Wants You!" poster. Uncle Sam looked suspiciously like W.C. Fields. The band played "Happy Days Are Here Again," and the audience went berserk. They entered right into the spirit of the joke. Ken had decided to go all out. We had passed out Styrofoam hats and campaign streamers. There was even a special "fireside chat" set for the monologue. That looked fantastic on HV.

"My fellow Americans," Toby started, in the time-honored tradition, "on Wednesday's show there was a spontaneous demonstration in this studio. I was deeply moved, but when it was over, we were ready to move on to other business, to put that ovation in the dusty corridors of fond memory.

"But we can't do that. There has been such a stirring tide of positive reaction that we can't take the easy path of personal preference and comfort." It was all delivered straight, to set up the gags that were scheduled to follow. "After seeing the scope of the response, and after exhaustive consultations, I have decided that it is my duty to become an official write-in candidate for the Presidency of the United States."

We had primed the audience for this moment. There were cheers and shouts. A small brass band led a parade up and down the aisles. Banners waved and streamers streamed. Toby struck an exaggerated victory pose, grinning like an idiot and stretching his arms toward the ceiling. Toby looked like he had been hung by his thumbs—and liked it.

"Let me make this perfectly clear," Toby continued, "I stand for something completely different for America. I stand for something different every night of the week—blondes, brunettes, redheads, and various combinations.

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"A famous President once said, 'Ask not what your country can do for you, ask what you can do for your country.' I expect to do a lot for my country, especially for the female half." He bobbed his eyebrows up and down like Groucho Marx.

"But seriously, you have a right to know where I stand on the issues." He moved to an easel that held a stack of posters.

"Here is where I stand on most issues." He removed the cover and sailed it across the stage. The first poster showed Toby sitting on a fence waving a cowboy hat.

"And here is where I stand on most other issues." The next poster showed Toby standing in front of a urinal, with a look of ecstatic relief on his face.

"Then there is disarmament." That poster showed the Venus de Milo.

"But there are some issues that I won't stand for at all—like sex. I prefer to lie down for that." The final poster showed Toby on a waterbed, surrounded by beautiful women clad—for the sake of Standards and Practices—in bikinis.

"Let's face it," Toby said, moving away from the easel, "we've been laughing at our Presidents since Martha Washington got splinters in her neck when George tried to give her a hickey with his wooden choppers. It's time to get the amateurs out of the White House and put a professional in.

"You want and deserve a President who knows what you want and need, a President who knows how to get it for you.

"And, believe me, when I am elected, are you going to get it."

* * *

We had Monday off. The network had the first of its new holovision movies to run. But we picked up the gag on Wednesday and Friday. Over the next weekend, we started to hear about the committees. There were 30 state "Toby Francis for President" committees and more being formed. They were planning a national coordinating committee and a telephone campaign to get Toby elected, for real.

Ken was contrite when we met on Monday morning.

"It looks like you were right, Toby," he conceded. "I guess the whole thing got out of hand. I've been on the phone since six." He sucked in a deep breath. "Those damn committees have everyone in a panic. The network's nervous. The lawyers are nervous. And I'm having a complete nervous breakdown."

Toby absorbed everything. He looked through a pile of messages. I figured we'd end the gag. I knew how Toby felt about it.

"It's time to bail out," Ken concluded. "If we don't, we're going to end up with the biggest fiasco since 'War of the Worlds.' "

"Just when I was getting to like the idea of being Vice President," I joked. I had been added to the ticket early in our "campaign."

"Maybe we just haven't gone far enough," Toby said, ignoring my joke. I couldn't believe that Toby was turning down the chance to bail out.

"How much further could we go?" Ken asked. We had already gone just about as far as we could—on the air. There's still a limit to what the network will permit. We'd come close to trouble

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with Standards and Practices over a line Toby had used, proposing to make Karl Keezler, our orchestra leader, Secretary of Agriculture. "After all," the joke had gone, "the band knows all about growing things, especially funny little cigarettes."

"It's been mild so far," Toby said. "Let's really burlesque the idea. Push it over the edge."

"You're the boss, Toby," Ken said with resignation. "Just let me know when you're ready for your parachute."

"We need to make a lot of changes in this great country of ours," Toby told our audience that evening. "We've been low for too long. It's high time we legalized high times." He lit a hand-rolled cigarette, puffed on it, and rolled his eyes. It was just ordinary tobacco, but the effect couldn't have been better if it had been prime Columbian weed.

"And it's time to legalize polygamy. When I'm in the White House, we'll have more than a First Lady. We'll have a Second Lady and a Third Lady as well." He paused, then added, "Maybe even a Fourth Lady, if I take my vitamins. There's a question of basic rights involved. Nobody tells you that you can have only one car, or one blue suit, right? So why should we let anyone tell us we can only have one wife?

"You've heard of kitchen cabinets, those unofficial advisors many Presidents have had. Well, I say it's time to get our President out of the kitchen and back where he belongs. I will not have a kitchen cabinet when I'm elected." He paused for the zinger. "I'll have a bedroom cabinet.

"And I'll cut taxes drastically, across the board. The current tax system is nothing short of slavery, and slavery is unconstitutional, right?" He was getting rousing shouts back with every, "Right."

"Instead of extorting money from hard-working Americans to support inefficient and crooked bureaucrats and politicians, we should make our government pay its own way, right?

"There are a lot of ways to do that. For example, we can start by holding bingo games in the Supreme Court and other federal buildings. We can open government-run casinos in every State, in every city. We can put our excess politicians and bureaucrats—and that's got to be at least half of them—to work running bawdy houses. After all, there's nothing the average politician knows better than how to screw the people."

Every joke was designed to offend as many people as possible. Some of the material was brutal. It drove Standards and Practices wild. They damn near pulled the plug on us in the middle of the monologue. By the end of the show, I figured that our campaign would be about as popular as leprosy jokes.

So I was wrong again. I don't know how or why, but Toby's plan backfired completely. And I guess I saw it coming before I got to bed.

Judy and I watched a tape of the show. I did a lot of cringing at the jokes, but Judy ate it up. She was yelling, "right," right with the studio audience. Toby looked a little glazed on the HV, maybe even a little crazed, like some Biblical prophet. He was sweating and breathing hard, and—with the HV—you could get carried away and think he was

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right there, talking just with you. I didn't sleep well that night.

Tuesday morning, I picked up my paper and found the political cartoon on the front page. It showed the Supreme Court justices calling bingo, with the caption, "Isn't that what they *have* been doing?" There was a variety of comment on the editorial page, but most of it was favorable.

Tuesday afternoon, a radical feminist group picketed the state capitol. They carried placards that read, "POLYGYNY, YES! POLYANDRY, YES!"

Two police associations supported legal gambling, prostitution, and marijuana. "Let us concentrate on real crime," they pleaded.

I don't want to suggest that everybody thought all of Toby's ideas were great. There were dissents, but they seemed to get buried. And Wednesday's mail at the studio included proposals from more than 200 women who wanted to be among Toby's extra wives. We even received letters or telegrams of support from seven Congressmen and two Senators.

So who went crazy?

On Wednesday and Friday, the jokes became cruder, more extreme, and more ridiculous. The writers started each meeting with, "Who haven't we offended yet?" and proceeded from there. They were having a ball.

"Look at the mockery we've had," Toby started on Friday. "We hear about the American Dream all the time, right?

"No one really defines it. Maybe *my* American Dream is free love, gambling, and getting drunk six nights a week. But the 'official' American Dream is supposed to be the glorious opportunity any American has, to start out poor and ignorant and end up rich and still ignorant enough to let the government steal 70 percent of his earnings to support anyone who wants to make a buck in a soft government job or just sitting at home. Right?

"We're stifling brains and guts, and rewarding laziness and inefficiency. It's wrong, wrong, wrong! Right?"

The audience screamed back every time.

"Don't penalize the people who show intelligence and initiative, reward them. Right?"

The response almost blew us "right" out of the studio.

I think it was that segment that did the job on us. We crossed the infamous "point of no return" that night.

Saturday was "Tokes for Toby" day. That went wrong like everything else. There were rallies on college campuses supporting Toby's candidacy. That evening's network news showed cops standing around smoking pot with the students. A farm group came out for legalized marijuana. "That's just what we need to make farming profitable again," a spokesman said.

I didn't get a chance to talk with either Toby or Ken over the weekend. When we met at the studio Monday morning, Ken showed us the results of a national poll taken over the weekend. Sixty percent of the people called thought that Toby would make a better President than either the incumbent or his offical challenger.

I didn't take the poll seriously. All it meant, as far as I was concerned, was that a lot of people were going along

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with our gag. Just the same, I started looking over my shoulder for the butterfly nets and the men with my straitjacket.

Ken Banding stopped talking to anyone but himself. We were all a bit strained. At our Monday show conference, Toby said just six words: "Tonight I'll fix it for good." Ken shrugged, I nodded, and the meeting was over. Toby took over all the preparations for Monday's holocast, or holocaust. He wrote his own monologue—something he hadn't done in years, scheduled the guests, and picked the music. Ken sat in his office all day—door locked, phone off the hook—and drank steadily. I had a few myself. It was that kind of day.

There were no laughs in Monday's show.

"A couple of weeks ago," Toby opened, "we started to run this campaign gag. That's all it was, something to milk a few laughs from. It was never meant to be anything more. We never dreamed people would take it seriously."

Toby was beginning to relax. He was going to pull the ripcord. I looked up toward the director's booth. Maybe the rest of us would get a chance to relax again, too.

"I know people have gone from show business to politics before, and there's nothing wrong with that. But I'm a working comic. This is my platform, where I belong, where I'm comfortable, not in politics.

"I could never be elected President. I don't have the proper education, background, or political connections. Those are all essential. And no write-in campaign could succeed, certainly not one started this late, and never for the Presidency.

"When I was a little boy in Illinois, I dreamed about being President. What child doesn't? I could visit Abe Lincoln's home and tomb. I wanted to be a good President like Lincoln or Washington. Many Americans have had that dream. But most of us stop dreaming when we grow up. We see that the Presidency is the hardest job in the world. It deserves and demands the best.

"This started as a joke, but it's gone too far to be funny. Thank you for your patience and support, but it's over, definitely over."

The band played "The Star Spangled Banner," and we all stood. There wasn't a dry eye in the studio. After the commercials we had guests who read from the "Declaration of Independence," and the "Preamble to the Constitution." It was a rousing, emotional show. The band played more patriotic music and the audience sang along. It was a grand evening, and even the crying felt good.

By Wednesday afternoon, we were back to our normal state of controlled insanity, convinced that the episode was over. Toby's speech had received a lot of publicity. Some papers printed the text and there was a lot of favorable editorial comment. All three networks featured the speech on their Tuesday newscasts.

At the studio, Toby laid down the law: not another mention of the campaign. The guests were carefully briefed. Wednesday's show went smoothly. Then we had a week off. Friday night there

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was a pro football game. Sports was bigger than ever with HV. And Monday, the network was running a pre-election special.

For our vacation, Toby, Ken, and I went fishing with our wives. Toby owned a small lake, so we had total privacy. Not many people had any idea where the place was. The 12-room "cabin" had indoor plumbing and electricity, but no radios, telephones, televisions, or holovisions. It was just us and the fish until election day.

We voted by absentee ballot, Toby and his wife in Nevada, the rest of us in California. It was late Tuesday night before we called an end to our holiday and headed back to Los Angeles. It was after three before Judy and I got home, ready for a short shower and a long sleep.

My phone was ringing when we got home, and kept on ringing. But it wasn't the private line, so I turned off the bell and let the answering service worry about it. It was nearly five before my private number rang and woke me. I did answer that. Ken was on the line, and he sounded totally berserk.

"It happened, Bill, it happened."

"What happened?"

"Those damn committees did it."

"Did what?" I wasn't fully awake yet.

"Got Toby elected President, you moron."

"You woke me for a stupid prank like that?" I shouted, awake finally. "The joke's over, remember?"

I heard my wife moving around. She was awake, listening to my half of the conversation.

"Listen you (characterization deleted)," Ken replied slowly. "It's true, every (obscenity deleted) word. While we were out on that (same obscenity deleted) lake, catching those (new obscenity deleted) fish, those (scatological characterization deleted) committees went ahead with their (obscenity deleted) telephone campaign. Toby's the new (truly imaginative obscenity deleted) President. Turn on the HV if you don't believe me. The networks are all running coverage. Everybody's been looking for Toby and you for the past eight hours."

"Ken, I swear, if you're pulling my leg, I'll have you served up for lunch in the commissary."

"Turn the (trite obscenity deleted) HV on, you (scatalogical characterization deleted)."

I did.

The first thing I saw was the President talking with campaign workers in a Washington hotel. The look in his eyes was more eloquent than the whispered, "What happened?" that a microphone picked up.

Then there was the familiar face of "America's most trusted newsman," behind the network anchor desk. His voice was calm and matter-of-fact. "The whereabouts of President-Elect Toby Francis are unknown. He is believed to be in seclusion somewhere in Nevada or California."

I guess that convinced me. You can't doubt "America's most trusted newsman." Or maybe I had just decided that it was time for a small room with rubber wallpaper. Especially after I heard the next line.

"Also unavailable is Bill Simmons,

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Francis's announcer and now Vice President-Elect."

That was too much. All of the serious thinking had to wait. In bed, Judy was giggling insanely and holding her stomach as if she were in pain. We looked at each other and then we were both laughing out of control. It hurt. When I tried to control my laughing fit, Judy started swatting me with her pillow.

The pillow fight was still going on when the reporters and Secret Service agents started banging on the front door a few minutes later. ■

CLARION WEST WORKSHOP ANNOUNCEMENT

Manuscripts for the 1985 Clarion West Science Fiction Writing workshop must be submitted by May 1, 1985. Clarion West will be held July 1 through August 9, 1985, at Seattle Central Community College in Seattle, Washington. This year's faculty members include: Octavia Butler, Arthur Byron Cover, and Marta Randall. The names of the three other faculty members will be announced later.

To apply, submit a 20 to 30 page (typed, double-spaced) manuscript of original fiction. The manuscripts may be one or two short stories, or a portion of a novel (include an outine of the novel). Also include a short statement about yourself and why you want to participate. A $50 refundable deposit, applicable to tuition, must accompany entries.

Approximately twenty students will be selected to attend. Fees for the six week workshop are approximately $1600. Send entries to: CLARION WEST, Seattle Central Community College-Continuing Education, Room 4180, 1701 Broadway, Seattle, WA 98122.

Each faculty member will give a public reading or lecture at the SCCC Broadway Performance Hall.

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The Alternate View

THE OTHER FORTY DIMENSIONS

John G. Cramer

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Does our universe have **other dimensions?** We know about the three spatial dimensions (in which we move) and the time dimension (along which we seem to be hurtling without control). But are there hidden dimensions not accessible to us, dimensions in which we could go adventuring, dimensions within which malevolent hyper-dimensional aliens may be lurking, ready to pierce our flimsy paper-thin three-space bodies with their terrible hyper-sharp claws? The notion of other dimensions has been a recurrent theme in science fiction from the time of Wells and Lovecraft to the present. Recent examples are Heinlein's *Number of the Beast*, in which two extra time dimensions (**tau** and **teh**) give access to alternate universes, and Hogan's *Genesis Machine*, in which two extra spatial dimensions (hi-space) are exploited for instant communications, gravity control, etc.

This Alternate View column is about hints from particle physics that our universe may have other dimensions . . . *lots* of them. In this issue of *Analog* you may already have encountered "The Lost Dimensions of Reality" by John Gribbin, a science-fact article on this subject. Dr. Gribbin has laid some excellent groundwork, permitting me to go deeper into some of the fascinating aspects of extra-dimensionality. The reader is advised, however, to read Gribbin's article before joining me on the extra-dimensional playground.

Gribbin's article describes progressive attempts by theoretical physicists to provide an overall theory including the three strongest natural forces (the strong, electromagnetic, and weak forces) along with gravity (the other known force). Their work suggests that the space in which we live and work is not four-dimensional but eleven-dimensional; that in addition to the familiar three spatial dimensions and one time dimension there may be seven (or more) "lost" dimensions, similar to ordinary space dimensions except that they are curled up into tiny little loops. This is the Kaluza-Klein (K-K) theory of extra dimensions.

You may well ask why we are suddenly talking about dimensions instead of forces. What can extra dimensions have to do with forces? We will start with the simplest application of K-K theory which deals with electric charge. Every electron spins on its axis in rough analogy to the daily rotation of the Earth. But while the Earth's spin could in principle be slowed or stopped (by a suitable application of Planet Engineering), only the direction of the electron's spin can be changed; it must always have the same magnitude be-

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cause all electrons have the same amount of spin. Further, when any atomic or nuclear system rotates, its angular momentum (a measure of speed of rotation) can have only a value which is a unit multiple of the electron's spin. The electron's spin is said to be **quantized** with an irreducible constant value.

The electron also has another quantized characteristic, its electric charge. All particles found in nature or produced in the laboratory have charges with magnitudes which are integer multiples of the electron charge. Since spin is quantized and charge is quantized, are the two somehow related?

An early suggestion that this may be so comes from nuclear physics. It was discovered in the 1940s that mathematical machinery used to describe the geo-

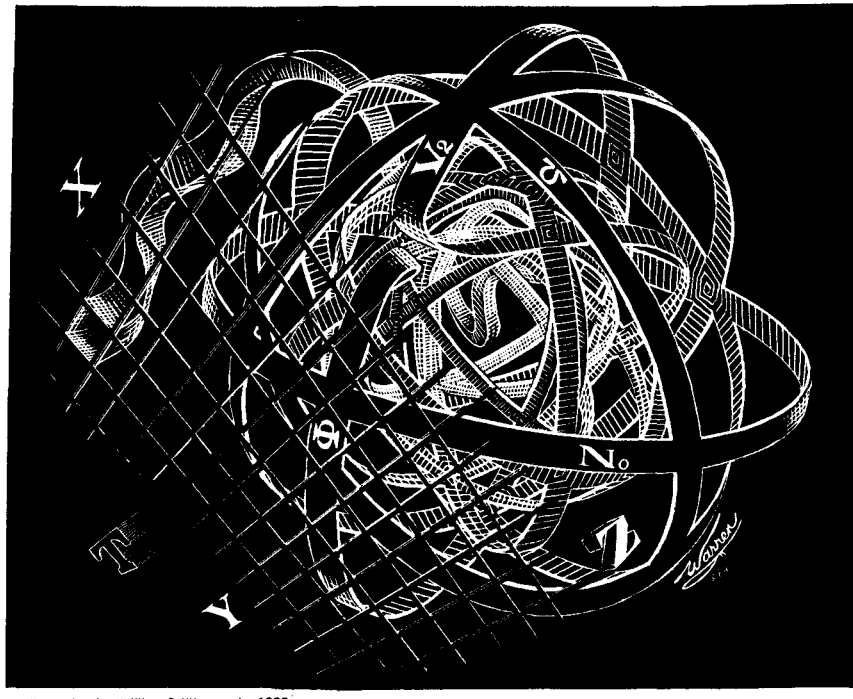

Illustration by William R. Warren, Jr., 1985

metrical rotations of particle spin in normal 3-space could also be applied to describe the behavior of electrical charges by inventing a spin-like quantity called "isospin." Isospin is not a normal 3-space vector; it is a vector in some fictitious extra-dimensional space which projects only one dimension into our universe. It is a useful concept because there are forces acting within a nucleus that can rotate or "flip" this vector: neutrons can be "flipped" into protons or electrons into neutrinos by an extra-dimensional reorientation of isospin.

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The Kaluza-Klein theory, relegated for six decades to obscurity as a curious but untestable variant of Einstein's general theory of relativity, has suddenly emerged as one of the hottest "new" theories around because it provides a way of relating forces to extra dimensions. The basic gimmick of the original K-K theory is that the electromagnetic force can be incorporated into the framework of general relativity by adding an extra spatial dimension, one which is curled up in a tiny loop. Each point of normal space becomes an extremely small loop of this extra-dimensional space.

A particle moving in this extra dimension travels around the loop and is soon back where it started. What we call electric charge, according to K-K theory, is actually motion in this dimension. A charged particle is traveling repeatedly around the K-K loop, even if it is at rest in normal space. If it moves, say, clockwise around the loop then it has a positive charge, while counterclockwise motion gives it a negative charge. Spin and similar rotations in normal space are quantized into unit angular momentum chunks because a single (or multiple) rotational flip through 360° cannot be distinguished from no rotation at all. In the same way, motion completely around a K-K loop brings you back to where you started, and this analogously leads to quantization of electric charge. The size of the unit charge and the strength of the electric force are inversely proportional to the distance around the loop: the smaller the loop, the larger is a unit charge.

There are also other connections embedded in the theory. Newton's 3rd law of motion (action = reaction) applied along the K-K dimension is equivalent to the law of conservation of electric charge. And the famous CPT theorem (see my article "Antimatter in the Universe," *Analog*, August, 1979) connecting the reversal of electrical charge with reversals in space and time directions is given a simple geometrical interpretation by this geometrization of charge. The K-K theory is "powerful" because it reveals connections between seemingly unrelated physical laws.

But the modern version of K-K theory is more ambitious than this; it seeks to incorporate not only the electromagnetic force but also the weak and strong forces into the framework of general relativity. This is done by adding enough extra dimensions to take care of all known forces. Quark properties like flavor and color become orbital dances in multi-dimensional K-K loops. This is not a simple change to K-K theory because the weak and strong forces are more complicated than electromagnetism. While electromagnetism can be viewed as the exchange (swapping) of a single particle (the photon), the weak interaction needs two different exchanged particles (W^+ and Z^0) and the strong interaction requires eight different exchanged particles (gluons). One might suspect that eleven extra K-K dimensions ($1+2+8$) were needed, but careful analysis shows that only seven K-K dimensions plus normal spacetime can accommodate all of the known natural forces.

However, there are already reasons for thinking that there might be an even larger number of collapsed K-K dimensions. A previous Alternate View col-

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umn (September, 1984) discussed the inflationary scenario of Big Bang cosmology, the idea that the early universe went through a phase of very rapid expansion in which its volume expanded by 10^{88} before settling down to the more leisurely expansion rate of today. A problem with this scenario is that to specify the initial conditions of the early universe would require about 10^{88} fundamental parameters. This is considered to be an absurdly large number of initital conditions. The early expansion can be specified more compactly by considering the initial universe to be a randomly disordered space of many dimensions. As the universe expands, most of these extra dimensions collapse into small K-K loops, transferring their disorder to the three "normal" dimensions of our world. Calculations show that about 40 extra K-K dimensions are needed for this process to match what we know about the early Big Bang.

And so the use of K-K theory to explain various physical phenomena has led us from one extra dimension for electromagnetism, to seven extra dimensions for all of the forces, and finally to about 40 extra dimensions to inflate the early universe. Applying K-K theory in this way is a very new idea. The full implications and quantitative application may need years of development. And it is possible that the whole line of development is completely wrong.

But 40 extra dimensions . . . What a lovely idea from the standpoint of science fiction! Even Hogan and Heinlein would probably have been a bit reluctant to suggest that there were 40 extra dimensions to our universe, but theoretical physicists are not so modest and have gone ahead and done it.

So let's start from the assumption that our universe has extra K-K dimensions and entertain some questions: *Q: Could one "enter" these other dimensions?* For the seven dimensions needed to explain the natural forces, we are already inextricably embedded in them. Your body is made of 10^{29} or so point-like particles: electrons, up-quarks, and down-quarks. These particles differ from one another principally because each kind is doing a different dance-step as it loops around in the extra dimensions of K-K space. One could imagine superimposing a hyper-rotation to change one dance-step to another, but this would have an enormous energy cost (and you wouldn't like the result).

Q: What about K-K dimensions beyond the first seven? If there are *more* than seven K-K dimensions, there are two reasons why we may not have noticed them: (a) the force associated with the dimension is so strong (small K-K loop) that all particles in our universe are constrained by available energy to be neutral and "at rest" within its loop, or (b) the force is so weak (big K-K loop) that up to now experiments have not been sensitive enough to show its effects. In fact the time-reversal asymmetry observed in the decay of the K°_{2} meson has been attributed to a hypothetical "superweak" force, possible evidence for a new K-K dimension.

Q: If there are other dimensions, could these lead to other universes? The present version of K-K theory does not have much to say on this point, so let me speculate a bit. If all of the particles of our known world are in some partic-

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ular state of rest or motion involving K-K dimension loops, then similar particles in other states of motion might be non-interactive and invisible, with only gravity to connect the two particle states. Our universe does have some invisible mass (see my February, 1985 Alternate View column), so perhaps another universe of particles might be superimposed on ours and without our being aware of it.

Q: What might be learned from a fully developed K-K theory? We have yet to appreciate the full implications of K-K theory as it applies to seven extra dimensions, but it offers the possibility of presenting a unified picture of gravity, electromagnetism, and nuclear/quark forces. No one can really guess what might come from such understanding; this is always the way with new knowledge. But it does seem that we may be on the borders of a new "dimensional frontier," that we may live in a universe of many dimensions while perceiving only 3 + 1, that we may be taking the first toddling steps toward understanding the other dimensions of the universe in which we live. ■

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IN TIMES TO COME

Our May cover, Bob Walters's first for *Analog,* is for P. M. Fergusson's short story "Gertrude." There's a tendency to think of history in terms of Big Names, the few which fill newspapers and books. In reality, history is at least as much the story of the "little guy" who does nothing more than operate a shovel or a bulldozer or whatever those things have evolved to in his period. And once in a while such a person, and/or his rig, just may have a bit more individual significance than you might think.

Tony Rothman, author of some of our more popular science fact articles in the past, returns with a new collaborator, G. F. R. Ellis, to "The Garden of Cosmological Delights." This is a comprehensive roundup of some of the main current thinking on the very large-scale nature and past and future history of the universe. We've had several pieces touching on aspects of that subject lately, but this hits some different ones—and cosmology is one topic whose cosmic significance hardly anybody can deny!

The May issue will also contain Part III of Charles Sheffield's *Between the Strokes of Night,* the conclusion of James Gunn's "Bill Johnson" series, and very probably new stories by J. Brian Clarke and Eric G. Iverson. Plus, of course, all the usual features and unpredictable odds and ends.

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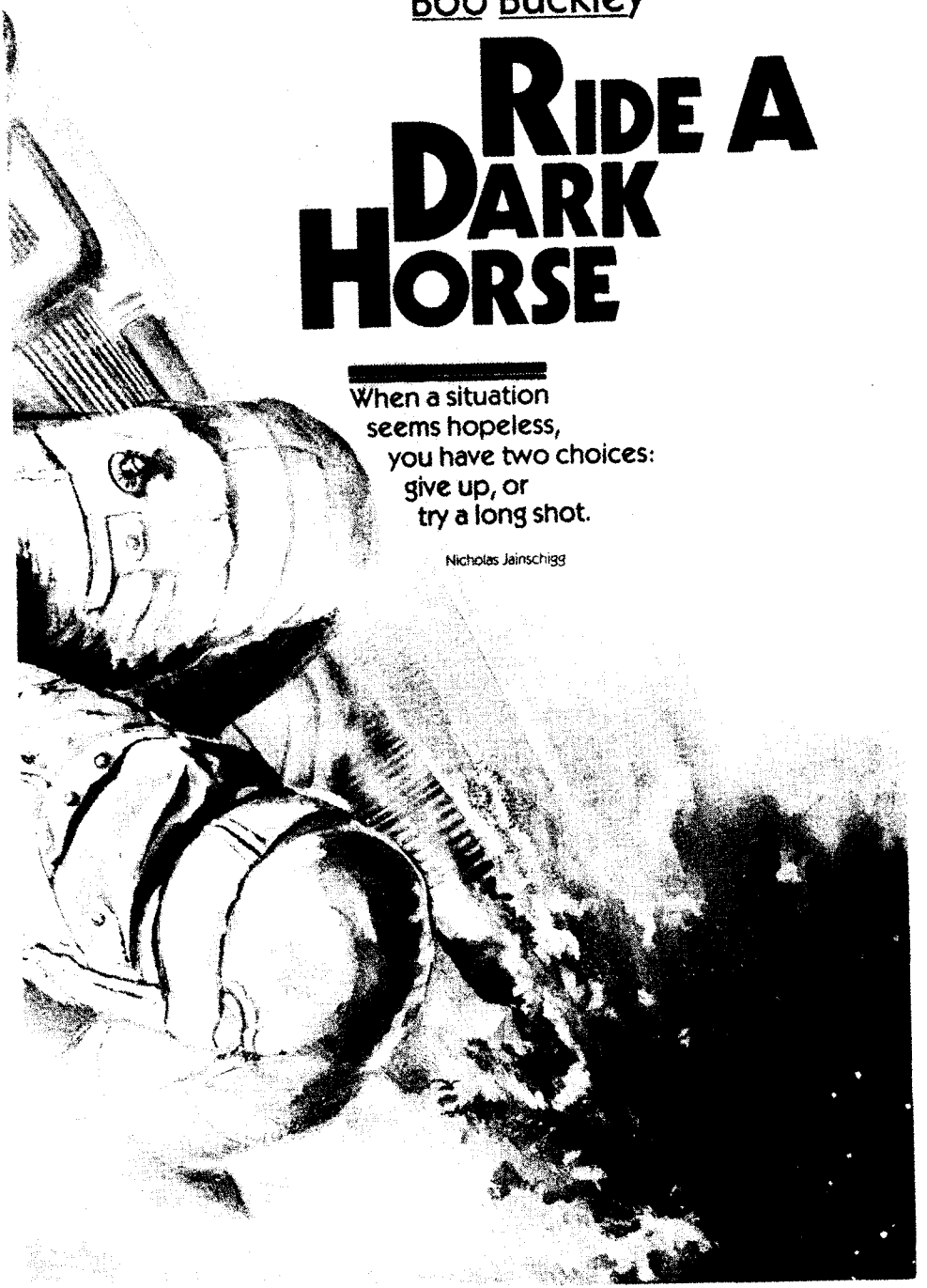
Bob Buckley

RIDE A DARK HORSE

When a situation
seems hopeless,
you have two choices:
give up, or
try a long shot.

Nicholas Jainschigg



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My sixth sense should have warned me that something bad was going to happen. The *ping*ing on the hull that began as a sporadic pecking early in the morning, ship's time, and gradually increased into a steady drizzle should have started alarm bells ringing in my head. Any strange noise was easy to pick out since the *Horse* didn't have drivers or engines, unless of course you wanted to include some clusters of clunky maneuvering thrusters spotted around her midline. That lack of oomph had bothered me for the first 20 million miles, or so. Heck, I was so used to having a six hundred million horsepower solid fuel booster pack thunder-rumbling in back of my spine that to suddenly lose it felt like losing a leg. Delaney had called me a stubborn reflex-jockey, but old habits don't break easy. There was a professional lifetime of bank shots throughout the solar system to put aside. Sometimes it seemed that I had spent most of my professional life as a glorified delivery boy. But this was the first time I was going outside the orbit of Pluto; the first time for any of us, Bernie—bless his alloy composite shorts—included.

The pinging? I should have recognized it, I had heard things like it before. You don't ignore clues out here. But I had other things on my mind.

By rights, I, Farside Panamint Barks—I know, stupid name, but what are you going to do when you have a romantic adventurist for a father—should have been captain of the *Horse*. But Don Delaney had more shares of company stock, and near equal time in vacuum, so that perk had gone to him when the shareholders had met. In a way, I was glad. A lot can happen over half a light year. And sometimes late starters CAN finish first.

We had come through okay, so far. The computers were our eyes. And out there, hidden behind a swale of dust and gas, was . . . well, something. . . .

This far out, Sol looked depressingly small. And Pluto and Charon were no more than a pair of lopsided eyes staring at you from out of the inky night. Poets called it the eternal dusk. You know how poets are. Since the creation of the habitats, the system was full of artists. Stars and planets were their meat. Well, they could have done a lot with the material out here. Pluto was fist sized, Charon half that. But they were brighter than most of the stars, even in crescent phase. If you were prone to loneliness, then this was not the best jaunt to volunteer for. Best stay curled up in front of a warm sun in the company of the inner system. But hey, life's a gamble. Right?

"Get your feet out of the screen."

My revery on practical astronomy was interrupted forcefully by a shove from behind. The gravity here on the bridge was little better than a whisper and I sailed halfway across the instrumentation pier before the safety web caught me. I clung there like an ungainly spider.

"That wasn't fair."

But Marie ignored me. Fastidious as ever, she gave the soiled screen a last flourish with her rag. "You pig. Don't you ever change your socks?"

Just a minor domestic squabble. In these cramped quarters they were a constant event.

"This is my watch, remember?"

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"You're relieved. It's your turn to cook. And when you're done with that, Bernie wants you to run another education program on ROBITSON-CRUSO."

"Where's the glamor? Jump ship with me and I'll take you away from all this drudgery."

I snatched a slip of paper from her belt.

"Comm-dispatch! You were holding out on me."

She snatched at it ineffectually. "That's for Delaney; his eyes only."

"Yes, but while he's off the bridge, I'm acting captain. Would you deny me my prerequisites?"

The message was direct and brief.

USV HORSE-49935-1/COMM SPC EURP-501

TO: R. D. Delaney, Captain USV HORSE

FROM: A. B. Gordon, Officer Commanding, Europa Control

YOU'VE SOURED THE CREAM THIS TIME, DON. I'VE GOT THREE CAPTAINS OF THE FLEET AND THE HEAD OF SPACECOMPAC FUMING BACK HERE WHILE YOU'RE SAILING OUT TO GOD KNOWS WHAT. SALVAGE RIGHTS DON'T APPLY TO PLANETARY BODIES, AND I'VE GOT ORDERS TO IMPOUND ANY DATA YOU PUT INTO STORAGE. COME BACK NOW AND MAYBE I CAN GLOSS THIS LITTLE INDISCRETION OVER WITH THE BRASS. WE'VE BEEN BUILDING AN EXPEDITION HERE, AND YOUR STUNT IS MAKING US LOOK LIKE FOOLS. LET THE PROS CHECK OUT NEMESIS.

DON'T BE STUBBORN, DON. IT'S OUT OF MY HANDS.

END: 6/9/2064:90/5

"Hummmm, our boss seems to have stuck his foot in it."

"He knows what he's doing."

I'd seen faces before like the one Marie was wearing. You can't argue with them.

"Hey, don't get stiff with me, girl. I'm with the program, Hon. Delaney called it right. We got the jump on officialdom. While they were busy counting their supplies, we were boosting for the void. Now that big ole' mystery out there is all ours. Right?"

Another dirty look. Sometimes you can't win. I withdrew to the galley and began pushing buttons. That done, I took a float below.

Emptiness. I had the whole of the bay to myself, all two acres.

Well, almost.

A mechanical spider dropped suddenly from the ceiling hatch.

I gave it a grin. "Bernie, you old space-dog, Marie said you needed me."

Never let it be said that mobiles have no sense of humor. They don't, but don't say it, anyway, because they take offense easy. I don't know who first started calling them mobiles. But the name stuck. That's MO-biles, probably because they're always venting their mechanical spleens on us humans.

Bernie was of the Detroit family, a GM omni-cluster with optional space pack and cognitive behavior enhancements. Let me tell you, it made him difficult to live with.

Bernie had a thing for independence and a slightly squeaky voice box.

"I'm on overtime and you're late. So

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don't bother interfacing with ROBITSON, I've already loaded a fresh memory. Your inefficiency doesn't matter to me, of course. It just means that many more credits in my account. Another twenty thousand and I'm independent. Sweat it, you organic slob. I won't be here to cover for you then."

He sprang atop a giant shipping frame wrapping a cylindrical tube. I knew what it was. I had helped load them. Together, it and its brother had cost half as much as the ship. And the *Horse* hadn't been cheap.

The bay was the largest space in the *Horse*. It had dark corners, smelled of grease and preservative solvents, and was heaped with all sorts of storage—the two biggest items of which were the laser boosters. And there was Bernie, looking a bit like a metal spider that had opted for a basketball scholarship at one of the Midwest think tanks astride one, jamming his manipulators up to the elbows in the unit's maintenance compartment.

"This an overhaul?" I called up. "Or are you just communing with your mechanical brothers?" These days, everything had submicroprocessors, even the zero-g toilet.

Bernie straightened indignantly. All mobiles had personalities. The designers must have thought it would make them more acceptable to us organic types. Most turned out okay. But I was starting to suspect that Bernie was one of their more unfortunate experiments in egocentric architecture. It wasn't that he was unfriendly, or abrasive. He just knew EVERYTHING. That by itself wasn't bad, but he always seemed to be able to find a chance to let you know it.

"You should have checked these after loading. Sloppy outfitting. If we had had to rely on these units you know what would have happened?"

He sounded disturbed, more so than usual, so I climbed up beside him and took a look at the panel myself. And let out a low whistle.

"What's the frequency supposed to be on this unit?"

"The specs are glued to the access hatch. See for yourself, not even close. Also, the battery was at half strength. I put in a new one just to be safe. Delaney won't like it, but I have my standards."

I started a diagnostic and groaned as the patterns flickered over the panel.

"Delaney must have done us a deal and picked these units up on the black market. His skin flint ways are going to be the death of us yet."

"Government rejects." Bernie didn't approve of Delaney's cost cutting any more than I did.

I glanced at him. "How do you know that?"

He tapped the brain case in his chest. "Goverment Surplus serial files through 2043 in here. I have a similar assembly working at the Pentagon."

"The boosters? Will they work?"

Bernie hummed, looked at the shadows draping the overhead, and didn't answer. That worried me more than one of his smart cracks.

I decided to see Delaney. This had gone on long enough.

I never got a chance.

You can't ignore a breach alarm, they're designed that way. Picture being

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lifted out of your skin by a handful of raw nerve endings. It's like that when the klaxon lets go.

I was in the emergency vac-suit before Bernie could manage to clamber down from the laser. Fear and love of living do wonderful things for motivation.

And just in time. Something white, fast, and smoking flew past my peripheral vision and took away part of the far bulkhead. The air in the bay saw its chance and left in a noisy giant's exhalation. Explosive decompression was not fun; I had seen too much of it while building the Habitats. I snapped down my helmet visor and went on internal life support just in time to see Bernie do a flying loop and snag the nearest stanchion with a flailing limb. Good thing, too. If he hadn't, he'd have been on a trajectory for the void via a new hole in the bay-skin.

Marie wailed a collision warning over the ship's intercom, and then that went dead, too.

I headed for the command module as fast as my arms and legs could push me. Bernie followed, spooling out a steady stream of technical abuse, most of it dealing with organic carelessness, while I tried to tune him out and failed. He was on the sacrosanct emergency channel that NOBODY touches. Not if they like to keep on breathing.

At the first lock I paused. There was air beyond. Only the bay had been holed. But once through the lock and into the cramped sphere, my relief saw that it was misplaced, and scrammed. I could see the sails on the big scanner. Picture two hundred square miles of mono-molecular fabric billowing in a high wind as it was shredded by unseen objects. What I saw was all that, and worse.

A suited, marshmallow figure turned toward me. It pointed at the aft screen.

There should have been a habitat sphere attached back there. There wasn't. Just a torn beam of alloy-composite.

"Delaney?" I didn't really have to ask.

"He was asleep." The figure said in an even, controlled voice very unlike my little Marie.

Well, now he was dead.

The face within the helmet looked like it was dead too.

The deep space radar unit began to sing a modulated, warbling sort of song.

Marie keyed the sensor rack. "Cloud's getting thicker."

Cloud? "But we're beyond the Oort." I had read the charts as much as anyone. There shouldn't be anything out here except some lonely molecules of elemental hydrogen and carbon monoxide, and a few whispers of icy dust. The sails had been deployed five hundred thousand miles after the last of the Oort debris had been left behind. It was the only sane way to do it. Light Ships can't maneuver in anything less than a million miles of elbow room. You just can't get the fine degree of control with light sails that you have with thrusters.

"I think it's Nemesis."

That stopped me. If it was Nemesis out there, then this was a new order of catastrophy.

"He's early. Check the doppler."

Sure enough. Stars can't hide, even black dwarfs, though this one had tried. The dust cloud had fooled automatic search on the radar. I threw in a filter

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circuit and there he was, shining on the screen in all his diminutive glory. In visible light he would have been as obvious as a black cat at midnight. But Nemesis was hot. Not hot enough for thermonuclear collapse, mind you, but bigger and warmer than Jupiter in his best days as a junior energy source. Nemesis looked like a torch out there in all that night. I ran a quick plot on his orbit. Then looked for planetary companions.

"Seems Europa Control was too conservative in their system model."

Marie was playing a tune on the thrusters, trying to avoid a fast-moving chunk of rocky debris that was giving the proximity alarm the shrieking fits.

"Why?"

"Because he's bigger than they said. And his orbit is several million miles closer by a factor of ten. He's coming in like a runaway locomotive. And he's got his family with him. Looks like two gas giants, and a couple of mercury-class rocky bodies. The remainder of the mass is concentrated in two healthy-looking asteroid belts spaced at six and twenty AUs. All this crap we're running into must be the leftovers." The screen I was watching blipped and drew a skinny purple line toward the flat ball that represented Nemesis. The termination of that line sent a little chill up my back. I reached over to the main control panel and flipped up a protective red cover. The switch underneath started flashing orange. "I'm blowing the sails."

"NO!" Marie's angry shout was lost in the noise as explosive bolts roared, cutting away our wings.

Ignoring the white-hot glare that emanated from behind Marie's visor, I lowered myself into a couch and started patching telemetry into the number cruncher. We had a pretty good brain on board, but I doubted PAPA or ROBITSON-CRUSO was up to playing loop-the-loop with this array of incomings. We were going to need some help.

"Going to full thruster mode. Sit down and strap in, Beautiful."

We were going to hit zero-angle with Nemesis at something close to .87 light speed; That was after you summed his approach vector and our Delta-V. His visage swelled perceptably on the screens, a vast, bloated coal with a wisp of something like clouds banding his midsection. Just below a sun in size, the stellar surface was a dull red speckled with islands of black. On infrared scan he looked more sun-like, but this was all red-herring. He was just a hardrock squirt, a great pretender.

"Doesn't look much like a killer." I commented.

Marie was still tying herself into her seat.

"What?" I'd never heard her snarl before. She *was* snappish.

"The dinosaurs. Nemesis put the whammy on them 65 million years ago. Probably made life in the oceans decide to put on bones and armor back at the closer of the Cambrian, too."

"That's theory," she said.

"What do you want? A smoking gun? Open your mind. Sixty years ago the idea of a black sun orbiting Sol would have got you a ticket to the Laff Locker. Science is evolutionary. Continental drift was a big yuck in the forties. Now half of Earth's power comes from tapping deep mantle thermoclines. Still dubious?"

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"Have you considered that we're about to die?"

Why were women always so practical? Couldn't she see the beauty in this?

"Minor complications. Don't go getting hysterical."

"Hysterical! I'll give you hysterical—"

Out of the corner of my eye I saw Bernie letting himself into the habitat. He looked like hell. The last hour had not been kind to him. He had been in a meatgrinder. One arm was gone and part of his third leg from the knee joint down to the grappler was missing.

"Nasty out there, isn't it."

He locked down the hatch and rubbed at his stumps. "Expensive," he said ruefully. "This will delay my freedom by seventeen years."

"Trust me, Bernie. You'll hate freedom. Decisions just give you heartburn; they're vastly overrated. Save your credits for something important, like a grease gun."

"I find your attempts at humor rather tiresome."

"Marie, have you been talking to this boy?"

"Shut up, Barks."

OK, so she was still nursing a depression. "How many boosters still work, Bernie?"

"One, maybe. The powerpack on the second is several thousand miles away by this time, I would judge. We lost it when the bulkhead went."

"And ROBITSON?"

"Functional. He wishes to express his concern over your blowing the sails."

"Fine. Tell him I'm concerned also. How's your grasp of orbital mechanics, Bernie?"

"I achieved a 3.945 average at Sandhurst Tech—"

"Good. Achieve your tin butt over here and start plotting a course past the limb of that star out there."

"I have a philosophical adversion to suicide." Marie growled. She had folded her arms, bulky though they were in that suit, across her chest.

"Relax. Someday you will thank me for this."

I fiddled with the screen until I could see port and starboard. The view wasn't encouraging. Our sails and their struts were now a pair of crumpled masses to port and starboard. We had drawn ahead of them slightly because of my maneuvering. They could be a problem if we got tangled up in them. They were about ninety times our size, though less than an eighth of our mass. I pointed them out to Bernie.

Then I noticed that Bernie had paused in his calculations.

"What's wrong?"

"We're going to die," he said dully.

Marie give a soft, hysterical giggle.

"So shoot," I told him. "What's so bad?"

"A close graze, no matter how we time it, will throw us out and away at the wrong trajectory. We'll miss the capture point of our system by a margin wide enough to send us skimming toward Epsilon Eridani . . . except by the time we get there you two will be shrivelled mummies, and I'll be down to my battery backups."

"Well, you've never liked company anyway." I stared up at the big star map that Delaney—God rest his grasping,

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cantankerous soul wherever it was now—had stuck to the overhead for reference. "Do we have any other options?"

"You know the answer to that as well as I. Shall I sugar coat the pill and say something amazing will happen: like unexpected rescue by a band of wandering space gypsies out for an alien lark?"

"Just set us up for that high-g loop. How long will it take?"

"Seventy-seven minutes . . . that is, unless you interrupt me with more foolishness."

I winked at Marie, who stared back uncomprehendingly. Oh well, her sense of humor had never been anything to start a career on. "You've got it. I'm going out. Marie, grab a repair module. We've got some thinkering to take care of before Nemesis gets too close."

It's black out this far. Not that there isn't any light: heck, all the universe is gleaming on all sides. But terrestrial eyes aren't lensed to capture the detail, so all you get is a dusting of pinpricks clumped in fuzzy clouds, and streamers of black gas or dust that don't really seem to be there at all. That's the spooky part, the black emptinesses that curl about the fringes of your vision. Sometimes, when you're concentrating on something down in your lap, you glance up and think something is going to grab you. And then you jerk, grin, look around to see if anyone saw you, and go back to whatever it was you were doing.

Marie didn't like the emptiness. It showed at the corners of her eyes, and in the set of her lips. Marie liked a warm, mothering sky tucked around her. She had come out only because of a greater fear, a personal demon that hid inside her head, driving her to escape the inner system. That made her dangerous. You see those demons sometimes. They look out through the soul and catch your eye when you least expect it. Marie's demon had been more than enough reason to reject her for this jaunt, but Delaney had overridden my objections.

And now Delaney was gone.

I led her out onto the black curve of the hull and pointed at the skinny sweep of jutting girders that led to the cargo shells. "Start cutting. We have to clear away all that junk before Bernie activates the thrusters."

"*Does it make any difference? Don't* just give me busywork to keep my mind off dying."

"I'm a lazy man, Hon. If I knew we were going to die, I'd be cooling my heels with a cold one, not banging around out here. Those cargo shells up there are massive and hang way out on our spin axis. If I had time, I'd bring them inboard and weld them to the Bridge habitat. But I don't have time. So we're going to cut them loose. Nemesis is going to get a little free mass courtesy of the Earth."

"I don't understand."

"And I don't have time to explain. Just do it."

The superheated breath of the torches made short work of the alloy composites. The strut connectors melted like spun sugar. One by one, the cargo shells trembled, then—as I got under the struts and heaved—they floated away.

Bernie came on the helmet circuit.

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"Are you clear? Thrusters in seven minutes."

"Marie?"

"I'm on the last. It won't give way."

I studied the angle of the strut. It was the main brace, probably steel cored. "Increase your oxygen feed."

I thought a moment.

"Fire on schedule, Bernie."

"I don't have a choice."

No, of course he didn't. I began crab-walking toward the base of the habitat, through a maze of heat radiators. The fins towered above me like a metal forest. If this was to work, I had to find a level spot. The blueprints were impressed in a memory gained within a safe, warm dome on Europe. But I had seen . . . yes, there it was.

I cut through the nearest fin and used it to begin building a pad. Midway through, I felt a jolt though the suit-boots.

Thrusters?

Too soon.

Then I saw something overhead: huge, black mostly, but ghostly white around the edges. Nemesis had not given up. He was still throwing junk at us.

Bernie was saying something, but his transmission kept cutting out as Marie modulated into the circuit. She was shouting. But I couldn't make any sense out of her words.

A chunk of dirty ice went past like the near miss of a baby planet—and took away most of our radio antenna as it left.

"Bernie?"

"Listening."

"I need a functioning Laser booster. Can you get it to me?

"I'll need help."

"Marie is available."

"Where are you?"

"Bridge skin, lower quadrant. Use strap-ons to guide it out of the lock.

I finished the first angle of the cradle and pulled the next into place. Weight was negligible, but sheer mass made the slab unwieldy.

"Marie?"

No answer.

"Marie? What's happening? Check in."

I hesitated. Go look, or finish this?

"Ten minutes to thrusters," Bernie warned. "I'm coming out. Set a flasher going."

"Can you see Marie?"

The pause seemed to go on forever.

Then. . . . "I see her. She's adrift."

I squeezed my eyes shut for a moment. My brain hurt. "Can you get her?"

"Which do you want? The booster, or Marie?"

"I'm not talking choices here."

"I am. There's only so much time."

"Both, Bernie. I want both. You figure out how to do it."

The welding seemed to go on forever.

Then something blacked out the star above me.

Bernie, with the booster.

"Put the base down here onto the cradle. Then I want you to run the control line through the bulkhead to ROBITSON. For once he's going to earn his keep."

"You're going to let him steer?"

"Damn right!"

I didn't see Marie, and dread wouldn't let me ask.

Damned mechanical independence.

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How could they know what was important?

Nemesis was a dying coal spanning half the universe. He glared at us as we skimmed his face, the rutted slag almost close enough to touch.

I monitored the projection as the data built up. The green line inched across the screen and swayed within the limit of capture.

"Add the impulse of the booster."

Bernie rattled on the keyboard.

The line swung away from Nemesis.

I let out a sigh and leaned back.

We'd make it!

With a belly full of data, besides. If Gordon could be brought around to seeing things our way there might even be a profit for us at the end of this rainbow.

Suddenly I had an idea.

"Make a message to Gordon at Europa Control: YOU WIN, WE'RE COMING BACK. NEMESIS IS YOURS. Sign it BARKS, ACTING CAPTAIN."

Nemesis was still huge on the screens.

"Delaney's down there, isn't he?" Marie asked.

The slagged face of Nemesis looked like a slab of cooling charcoal. He wasn't gas; Nemesis was solid, like a molten ball of metal with a skin of rock crusting his exterior. Delaney would touch and flash white-hot for just an instant. Then the cargo shells . . .

There hadn't been time for an explanation earlier, less time to put into words just how scared and uncertain I had been, or how wildly I had been gambling. But the play had worked, and you can't argue with success. I had read about those slingshot orbital stunts, had even tried a few in simulators, but this had been the first time for real. Concentrate mass to improve maneuverability, cut away the excess, and dive in close. With a real sun below us we would have fried, but Nemesis was a cold cookie. We had skimmed close and he had thrown us away. The booster had provided a bit of finesse, a kick in the right spot. And now it was a free ride home. Time to patch up old wounds now.

"He was long dead before he got close." It was a lousy comfort. But what else was there to say?

Marie sighed. Her left side was shrouded in bandages. I was a passable nurse, but knots were not my best play. She looked like a ball of badly tied string.

"He was my father."

Delaney? "Impossible!"

"He never wanted you to know. He had a lot of pride. My mother died out here two years ago. This was his second try. He was sure he could make it this time."

"Well." Surprise always makes me speechless.

"At least you lived."

"Because of Bernie. Why didn't you come after me?"

My turn to sigh. "I trusted you. You can handle yourself okay."

"That's all?"

"You need more?"

She smiled. And that was probably the best answer. ■

● Nothing that is worth knowing can be taught.
Oscar Wilde

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on gaming

Dana Lombardy

Two new releases are out for the *Traveller*® science-fiction role playing game by Game Designers' Workshop (Box 1646, Bloomington, Il 61701). *BeltStrike* ($12.00) and Aslan *($6.00) are great additions to the extensive line available for those who play Traveller*®. And even if you just like to *read* SF instead of play it, you'll find these modules interesting and thought-provoking.

Aslan is *Alien Module 1* with information about a proud warrior race of ferocious carnivores that has evolved to high intelligence. The Aslan rule over hundreds of star systems within the Imperium, but much about these creatures was unknown. The 40-page booklet describes in detail this alien race, its homeworld, and its starfaring society.

While thousands of life forms within the Imperium are intelligent, reasoning beings, there are only six major intelligent races that have progressed technologically to the point of having the "jump drive" vital to space exploration. The Aslan are the youngest of these races.

The material presented in this module enables you to either incorporate an Aslan creature into your games as a Non-Player Character (NPC)—someone your group of adventurers may encounter during play—or you can assume the role of an Aslan for a different gaming experience.

The booklet gives you the necessary information to choose an Aslan career, such as space service, military service, wanderer, management, outcast, pirate, envoy, scientist, etc. The tables and charts also give the data necessary to generate specific attributes and skills needed in order to use Aslan characters in *Traveller*®.

The Aslan are evolved from four-limbed carnivorous pouncers. The females control industry, trade, and commerce, while the males are concerned mostly with military operations and the acquisition of territory. The proportion of females to males is 3 to 1, and families or clans are the most important social structure in Aslan culture. Clans are independent, but cooperate often since there is no central government.

The last few pages of the *Aslan* module are devoted to a short adventure scenario that involves a quest by an Aslan noble to find his favorite nephew. He needs humans to assist in the search in this particular sector of space, and your character is likely to be selected for the starship's crew. I won't spoil the surprise by telling you the dangers involved, but the human characters must use some detective work to find out the motives behind the quest if they are to survive the adventure.

BeltStrike is a very detailed adventure about mining in the Bowman asteroid belt. The boxed module includes an 11-by-17-inch color map of Koenig's Rock (an underground mini-city on one of the asteroids), 12 character identifi-

(continued on page 185)

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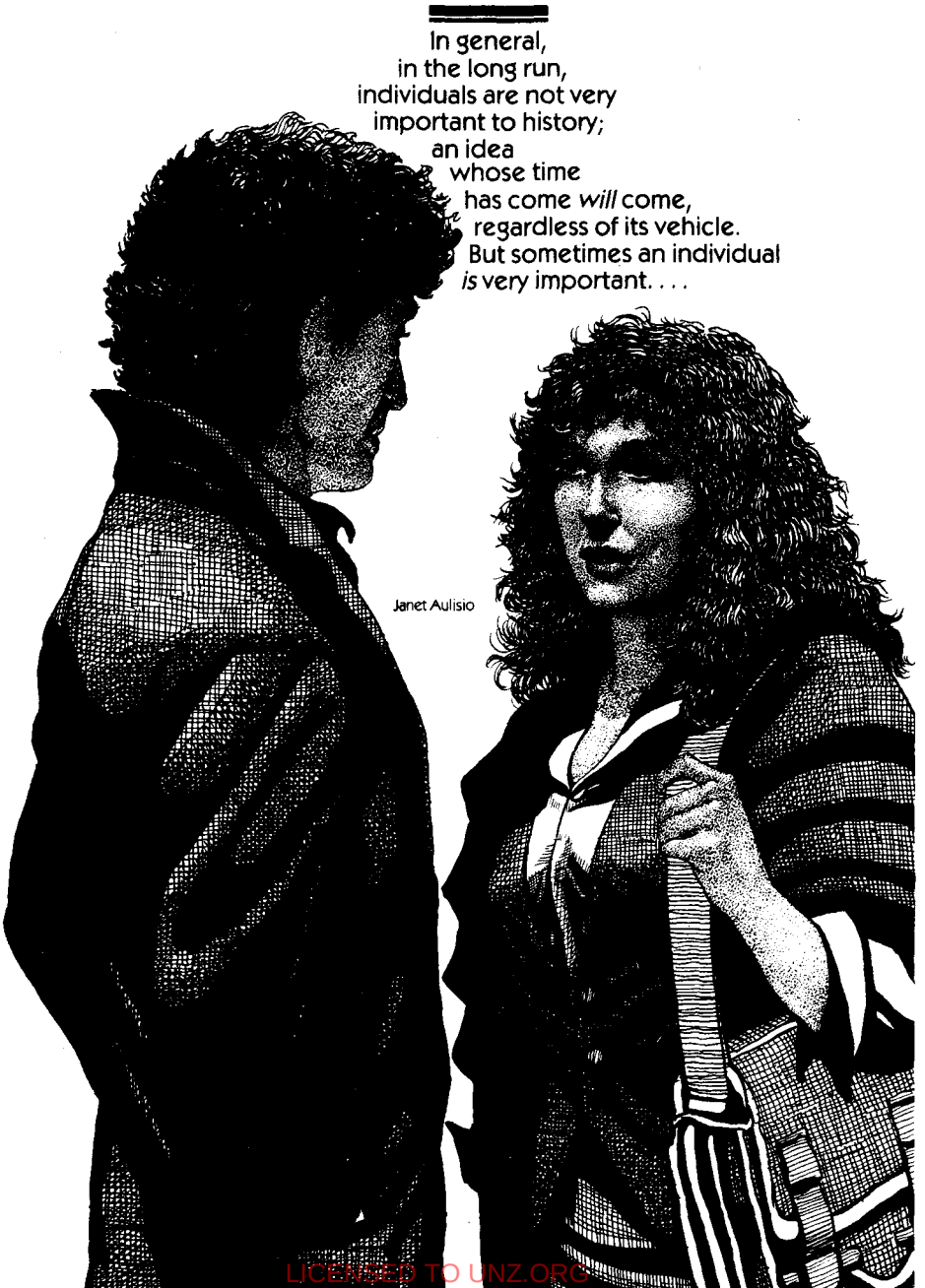

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James Gunn

MOTHER OF THE YEAR

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The man lying behind the large cardboard boxes and the overflowing trash containers opened his eyes to a half-circle of faces framed against the blue sky. One of the faces was older and sterner. Below it was a blue uniform. "You can't sleep here, mister," it said.

The man pulled his old gray tweed jacket a little tighter around his body and sat up. "I wasn't doing much sleeping, I assure you," he said and grinned.

It was a good grin and a pleasant face, even though it seemed a bit blank at the moment as if it had been wiped clean by the night's healing hand. The face was a golden brown, not as if it had been tanned but as if that were its native color, and it was smooth as if fresh shaven, although clearly the man had not had the opportunity to shave. He had dark, curly hair, and when he got up, as he did now, he was of medium height. In fact, though he may have been better looking than most, he seemed an average sort of person, a man easily overlooked by those who only passed by.

"We don't allow vagrants around here," the policeman said. "The Capitol and the White House ain't that far away. It don't look good."

The policeman was surrounded by children, big and little, white and black and brown, clean and dirty, neat and ragged. They had gathered as if by magic to stare at this curiosity in their midst. By their dress and the books in their hands, some of them were on their way to school. Others, perhaps, were only loitering, looking for excitement or trouble. One of the younger children stuck her tongue out. The man smiled at her. An older boy dressed in ragged jeans and a dirty jacket held his right hand with the thumb hooked over his waistband near his back pocket as if it held an amulet, and his eyes were narrow and calculating as he studied the man who had been sleeping in this dirty alley. "Whatcha doin' here anyway?" he asked.

The man patted his pockets and pulled a billfold out of the rear one. He opened it for the policeman's inspection. "I've got money and credit cards," he said. There were a few bills in it and a couple of plastic cards. "I just got trapped here last night and couldn't get a cab, so I decided to wait out the night. Pretty cold, too."

"Okay, what's your name?" the policeman asked, taking out a pad of paper and a pencil.

The man looked at one of the cards. "Bill Johnson," he said.

"You don't know your own name?"

"Just a habit, officer," the man said. "I'd rather you didn't write this up, however. After all, I haven't broken any laws."

"You think sleeping in the street is legal in this town?" the policeman asked.

"I think he's a looney," the older boy said. He was looking at the billfold in Johnson's hand.

"Go on about your business, Tommy, if you have any," the policeman said.

"What's going on here, officer?" asked a woman's voice from behind the throng of children.

The policeman turned, motioning to the children as if he were parting the Red Sea. "Get away. Go along to school or wherever you're headed. It's just this man here, Ms. Franklin," he

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said to the young woman unveiled by the children. "I found him sleeping behind these boxes, and I'm trying to find out what's going on."

"Is everything all right?" the woman named Franklin asked. She was of medium height and slender, with dark blonde hair and blue eyes and a face and figure of unusual beauty. The younger children clustered around her and the older boys gave her room, appraising her out of the corner of their eyes and unconsciously straightening their backs and brushing the hair from their eyes.

"Perfectly fine, ma'am," Johnson said. He smiled at her.

"Says his name's Johnson, Bill Johnson," the policeman said, putting away his pad and pencil.

"I'll be responsible for Mr. Johnson," the woman said. "I'll see that he gets wherever he's going."

"That's fine with me, Ms. Franklin," the policeman said. "Get along to school, you kids! Go on, now!"

The children stirred but did not disperse. The policeman moved off unhappily as if searching for more satisfying situations.

"Do you want to come with me?" the woman said.

"Very much," Johnson said.

"You can go on about your own business if you like," she continued. "I'm going to work, but I can find you a taxicab or a hotel." Her voice was lovely, too, low and melodious.

"You're kind," Johnson said.

She shrugged. "Just common courtesy."

"I was hoping for more." He dusted himself off and straightened his clothing. "I'm ready."

They moved out of the alley onto the street, the children following them as if one of them were the Pied Piper. "So your name is Bill Johnson," she said.

"I think so," he said.

They were halfway down the street when Johnson stopped suddenly. "Can you wait just a moment?" he asked. "I've forgotten something." He turned and ran back the way they had come, down the odorous alley to the spot where he had been lying. He looked around the area for a moment and saw a piece of cardboard with some writing on it. He glanced at it, folded it so that the writing was inside, and walked quickly back toward the little group with the piece of cardboard in his hand. The children were clustered around the young woman. It was clear now who was the Pied Piper. Johnson studied her as she talked to the children, clearly caring about them.

"Okay," he said.

She looked up at him and smiled. "Go on to school, children," she said. For her they did what they would not do for the man in uniform, moving off, chattering and waving their hands. "I'm Sally Franklin," she said. "And I work in the People, Limited building just down the street. If you want to walk there with me, we can get you settled somewhere. Where is it you belong?"

"Would you believe me if I told you I don't know?" he asked.

She tilted her head to look at him as they walked along. "I'm in the business of believing people."

"You're good at it," Johnson said. "That's because you like people, and they like you." He looked at her as if he were seeing not only the person in

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front of him but all the people she had been and might yet become.

Within a couple of blocks, the streets were busier, the sidewalks were cleaner, and the buildings were large and institutional, with sawed limestone exteriors and polished brass street markers on their corners. Where there were brief stretches of green lawn in front of or beside the buildings, some of them had neat signs identifying them. One of them read, "People, Limited."

"This is where I work," she said, turning in at the doorway. She had her purse open in her hand and an identification card inserted in a slot beside the plate-glass doors. They swung open and she motioned Johnson to go in.

An attractive dark-haired young woman seated at a desk just inside the doorway looked up as they entered. "Good morning, Ms. Franklin," she said and gave a curious look at Johnson, but didn't say anything, as if she were accustomed to seeing the other woman with strange companions.

"Jessie, this is Mr. Johnson," Sally Franklin said. "I found him in an alley." She smiled at Johnson as if to say it was a joke between them. "See if you can find him a place to stay, or transportation, or whatever he needs."

"How about a job?" Johnson said.

"You don't have a job?" Franklin asked.

"I don't think so."

"There's a great deal you don't know about yourself," she said, looking at him without accusation, "but that's none of my business. We're always looking for volunteers. We don't have many paid positions, but why don't you fill out an application, listing your qualifications and employment record, if you have any, and if we can't find something for you here maybe we can locate employment elsewhere."

"You really are kind," he said, holding out his hand.

She took his hand and pressed it briefly. "I seem to get involved with people who don't have a home or a future," she said and smiled. She turned toward the elevator a few feet away.

"Strays?" he asked.

"Strays," she agreed.

"Thanks for everything," he said.

She stepped into the elevator with a wave of her hand and was gone. "She's a remarkable woman," Johnson said, turning to the young woman at the desk.

"Without her this organization would be nothing," she said.

"What's her position with this organization?" Johnson asked.

"She is the organization. Executive director," the woman said shortly as if impatient with Johnson's presence.

"She's very young to have such a responsibility. And very beautiful."

"What's wrong with that?" the woman at the desk asked sharply. "She's very smart, too."

"I can see that," Johnson said. "It's just that from her appearance and her way with children, she looks as if she should be adding to the population, not trying to reduce it."

"That's all you men think about," the woman said, biting off her words. "Well, she's got more important ambitions, and you ought to be thankful she has. Overpopulation is the most important problem of our time." Clearly the subject was the focus of her life, and she was just getting warmed up to it.

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Johnson held up his hands in submission. "I'm a convert," he said.

"People take advantage of Sally," the woman said, almost as if to herself. There was no doubt that she included Johnson in that group. "Someday, unless there's some providence watching over her, she's going to have a bad experience—and then I'm afraid of what will happen."

"Yes," Johnson said. He paused and added, "I'd like to help. I'd like to look after her."

"You?" the woman asked skeptically.

"I may not seem impressive at the moment," Johnson said, "but I do feel a sense of commitment to what this woman is doing. It's terribly important. And I feel as if there were some danger to her and to what she is doing that I might be able to help with. I would work cheap. For nothing if I could live on it."

The woman looked at him as if she were impressed in spite of herself. "Do you want that application?" she asked.

"How about the place to stay first—not too far away, perhaps, and not too expensive."

A few minutes and a few telephone calls later, Johnson was back on the sidewalk with an address and directions on a slip of paper in his pocket. He still had the piece of cardboard in his hand. He paused at the first corner to unfold it and read:

"Your name is Bill Johnson. You have just helped solve the problem of political terrorism and launched humanity toward the stars, and you don't remember. You may find the newspapers filled with reports of what happened, but you will find no mention of the part you played.

"For this there are several possible explanations, including the likelihood that I may be lying or deceived or insane. But the explanation on which you must act is that I have told you the truth; you are a man who was born in a future which has almost used up all hope; you were sent to this time and place to alter the events that created that future.

"Am I telling the truth? The only evidence you have is your apparently unique ability to foresee consequences—it comes like a vision, not of the future because the future can be changed, but of what will happen if events take their natural course, if someone does not act, if you do not intervene.

"But each time you intervene, no matter how subtly, you change the future from which you came. You exist in this time and outside of time and in the future, and so each change makes you forget.

"I wrote this message last night to tell you what I know, just as I learned about myself this morning by reading a message printed in lipstick on a bathroom mirror, for I am you and we are one, and we have done this many times before."

The man named Bill Johnson stared unseeing down the long street until he stirred himself, tore the piece of cardboard into pieces, and stuffed them into a trash receptacle. When he looked up he saw the older boy in the jeans and dirty jacket. He still had his thumb hooked over his waistband. But he wasn't watching Johnson. He was watching the front door of People, Limited.

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The hotel was half a dozen blocks away, on the uneasy edge between the White House-Mall-Capitol Hill area of massive stone government buildings and the decaying slums teeming with children and crime and poverty that half encircled it. The edge was continually shifting, like an uncertain battlefield between armies of ancient antagonists, as old areas deteriorated into near abandonment or were torn down to make way for big new structures, some of them commemorating the dead and gone, some of them dedicated to a dream of things to come.

The battle for the soul of the hotel was still in doubt, but the dusty lobby, presided over by an elderly clerk all alone in what had once been bustle and glitter, was haunted by a premonition of defeat. The room to which Johnson admitted himself was a little cleaner, but it, too, had the kind of embedded dirt and irrepressible odors that nothing but total renewal could ever obliterate. It held an old bed, a couple of tattered understuffed chairs, a floor lamp, a telephone and a table lamp on a night stand beside the bed, and a bathroom with pitted porcelain tub, cracked lavatory, and stained toilet, a single towel but no wash cloth, and a hand-sized bar of Ivory soap whose paper crackled with age when Johnson unwrapped it.

The one new object in the room was a color television set, some owner's forlorn attempt at remodeling. Johnson stared at it for a moment when he came out of the bathroom and turned it on. A soap opera titled "All My Children" swam into view. Johnson ignored it and began to go through his pockets. Besides the billfold that he already had glanced at and was remarkably bare of identification other than a Visa card and a social security card enclosed in plastic, he had a few coins; a few bills, some of them oddly colored and labeled "King Scrip," which he crumpled and threw in the waste basket; a pocket comb, and the receipt for a one-way airline ticket from Los Angeles to Washington, DC, arriving at Dulles Airport. It had a baggage claim check stapled to it.

Johnson looked up the telephone number for the airline, dialed it, and asked the uninterested clerk if she could have his bag delivered to him at the hotel. At first she refused to do it, but when he insisted he didn't have transportation, something must have clicked in her memory, for she suddenly asked if he had been on the plane whose mobile lounge had been hijacked.

"All I want is my bag," he said. "I don't have any clothes."

"But if you were—"

"It doesn't matter," he said. "Do me a favor. Mark it up to public relations. I'll leave the claim check with the desk clerk in case I'm not here."

When he turned back to the television set, the soap opera was over. A commercial had already started. It showed vast numbers of children covering all the curved surface of what seemed to be part of a globe. They were all races, all colors, well dressed and ragged, but many of them looked hungry and misshapen and sad. They were all moving toward the viewer, and as they got closer and bigger, more of them kept coming behind, and there was no end to them and they blotted out the screen.

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In the darkness that followed, a woman's voice said, "Children are a blessing and a joy. But not when there are more of them than a family can feed and care for and love. Then they are a reproach and a tragedy and a sin. And the human family has been having too many of them recently." The screen cleared and revealed Sally Franklin dressed in a neat, pale-blue suit standing in front of a full-color reproduction of the Earth as seen from space. "World population was two and a half billion in 1950, three and two thirds billion in 1970, nearly four and a half billion in 1980." The view of Earth that had been bright with sunshine, streaks of clouds, and blue seas steadily darkened. "The end is in sight. And the answer is up to you, every one of you. Before you create more babies—think! Think about not only whether you can care for them, but whether this world of ours has room for them. It's better to have one or two happy children than three or four who don't have enough; better to have two billion people on Earth with a chance for the future, than eight billion or eighteen billion with no chance at all. It's our decision. All of us. It is not the problem of people who live somewhere else whose skin is a different color or who belong to a different race. It's our problem. All of us. And we've got to solve it. All of us. Or else—" The circle of the Earth had turned completely black and so, with startling suddenness, did the entire television screen. With equal suddenness, white words sprang out upon the screen that read, "People, Limited," and a man's voice said, "The preceding message was brought to you by this network as a public service. It is being shown, in appropriate translations, in every part of the world reached by television, and elsewhere by film or other means."

Johnson reached over and turned off the television set, picked up his jacket, and left the room.

The receptionist at People, Limited looked up from the employment form and said, "What can I do with this? Outside of your name, there's no information on it."

Johnson smiled. "If I were trying to deceive anybody, I would have made up something. It's just that I have a problem with my memory. If I have a past, I don't remember it. If I have a work record, I don't know what it is. If I have an education, I don't know where. If I have skills, I don't know what they are." Before she could speak, he went on, "But I do have a commitment to what this organization and Ms. Franklin are doing. And I would do anything honorable to help them succeed."

She frowned and then sighed. "But what can I do? Our personnel people will just throw this out."

"I'll work as a volunteer," Johnson said. "Anything that would let me watch over Ms. Franklin."

Neat and unthreatening, he stood in front of the reception desk in the polished, well-lighted lobby, looking directly into the eyes of the dark-haired receptionist.

"How would you live?" she asked.

"That's not important."

She sighed again. "I'll put you on the temporary employment list. The personnel people don't have to approve that

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for a week. Maybe by that time you'll have proven yourself of some value."

"Oh, I will," Johnson said.

"It only pays minimum wage. Just turn in your hours to me at the end of the day—"

"Don't worry," he said. "My goals are the same as yours."

"I hope so," she said.

The elevator doors opened, and Sally Franklin came out followed by a man and a woman talking rapidly to her. She had an attache case in her hand, and she was listening and responding in fragments when she saw Johnson. She stopped. "You're still here?" she said.

"I'm back," he said. "To be your bodyguard, your personal assistant, your porter, your gopher . . ."

Franklin looked sharply at the receptionist. "But I don't need anybody like that."

The receptionist looked embarrassed and helpless. "He—I—"

Johnson shrugged and spread his hands. "It seems I'm not good for anything else."

Franklin looked at him and shook her head. "Oh, all right. But we've got to find something else for you to do." She turned to the other two. "I think I've got it all. Johnson will go with me to the press conference. You can stay here and work on the Delhi meeting."

Outside, Johnson reached for Franklin's attache case, and after a brief resistance she let it go. "It gives me something to do," he said.

"Oh, all right. It isn't far. But I don't know what I'm going to do with you."

"Nothing," Johnson said. "Nothing at all. You won't even know I'm around."

"What brought you here?" she asked.

"I don't know," he said. "I only know what I'm doing here."

"And what is that?"

"Trying to protect you—and what you're trying to do."

She shook her head. "What makes you think you can do that?"

He laughed. "Do you want me to list my qualifications?"

They were walking east on the broad avenue and Franklin kept glancing sideways at Johnson as if trying to understand him. "I usually have a feeling about people," she said, "but I can't get a handle on you. You're going to have to tell me something about yourself—all these mysterious statements about not knowing where you belong or if you have a job or what brought you here. That was all right as long as you were a—"

"A stray?" Johnson suggested.

"Yes. But if you're going to be—"

"Your faithful servant?"

"—I need to know more about you." She finished breathlessly. "Why do you make me feel so frustrated?"

"It's because I have a queer memory. It works only one way."

"It's the same with everybody."

"Mine works forward, not back." He hesitated for the first time. "I'd rather not tell you any more. It will make you sorry for me, and I don't want that. The result—"

"Hang the result," she said, almost angrily. "You can't stop now."

"I remember the future," he said. "But I don't remember the past. I seem to wake up periodically without any personal memories, but I have glimpses of what the future might be like."

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She gave him a sidelong glance. "That must be—disturbing."

"I know it's hard to believe, and I'm not asking you to believe it. Only to believe that I hope to do good and that I would never do you harm."

"Can you see my future?" she asked.

"Are you teasing me?"

"Can't you tell? No, that's unfair. I'm trying not to."

"I'd rather not tell you. Believe me, it's a burden."

"Tell me," she commanded. "What's in my future?"

"I see only in flashes," he said reluctantly. "That's the way it always comes—a vision, not of the future because there are many futures, but of the natural consequence of any set of circumstances. And it shifts, like the image in a kaleidoscope, from moment to moment, as individual actions and decisions reshape it. One can't look at it steadily without getting dizzy."

"You can turn it off, then?" She spoke as if she were beginning to believe him.

"Only partly. Like not looking at something. You know it's there, but only as a background."

"You haven't told me my future," she reminded him.

"Some people are more important to the future than others—not more important as people but more important in that their actions and choices have more influence in shaping the future. I sense them as a kind of nexus, a place where lines to the future converge and make the individual and the area immediately surrounding the individual more vivid, more colorful, more—real."

"And that attracts you?"

"Like a moth to the flame," he said and smiled. "The serious answer is: sometimes."

"What decides?"

"The future," Johnson said simply. "Sometimes I can't stand to look at it, and then I have to do something."

"To make it better?"

"To help others make it better. I'm speaking theoretically, of course, because I can't remember what has happened before. If it has happened before, and I am not just living a great delusion. But I can't perceive the consequences of my own actions except as they are related to someone else. It's as if I had a blind spot, like being able to see everybody but yourself. So I can't know what would happen if I did something. Only if someone else does something."

"You still haven't told me anything about myself."

"You're starting to believe me."

"Shouldn't I?"

"You see the consequences in me."

"You're not so bad. You're thoughtful, gentle, kind—"

"Troubled, sad, distant . . ." He smiled. "You see? I said that one of us would end up feeling sorry for me."

"You said I would, and you're right. You haven't told me in so many words, but apparently you see me as one of those persons you were talking about."

"Do you really want to know how important you are?"

She thought about it. "I guess not," she said and smiled in a way that seemed to brighten the air around her. "Besides, we're here."

"Here" was the side entrance to a large public building. They went through the doorway and through a backstage

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area to the wings of a small auditorium. A harried, balding little man was there to meet them. "Sally," he said, "they're waiting for you. This is a tough bunch, and they're getting tougher. I've been listening. I think they're going to give you a hard time."

Franklin patted him on the shoulder and winked. "Don't worry, Fred. It does them good to wait for a few minutes. And I'm not worried about a few cynical reporters." She turned to Johnson and retrieved her attache case. "How am I going to do?" she asked softly.

"Great," Johnson said.

She smiled at him and walked to the center of the stage where a wooden lectern had been placed, so massive it looked as if it had been built into the hall. Although the auditorium was small, the audience filled only the first few rows. The overhead lights were pitiless. Franklin looked lost behind the lectern as she opened her attache case and removed a handful of papers, though she never afterwards referred to them, and stood for a moment looking out at the puddle of skeptical faces. "I'm Sally Franklin, executive director of People, Limited, and I've been asked to make myself available for questions about our new program for population control. By 'our' I mean not only People, Limited, but Zero Population Growth, Planned Parenthood, and half a dozen other groups dedicated to the problem of overpopulation. Each of our organizations has its own program, but we are coordinating our educational efforts for this drive.

"The year coming up has been designated the International Population Year. Every cooperating nation will be conducting a census that is expected to be more accurate than anything presently available. Each one also will gather data on population growth, resources, and resource projections. All of this information will be placed in databanks for further study and reference. The mission assigned to People, Limited and other privately supported groups concerned with overpopulation is to educate people to the need and means for family planning. We have prepared extensive campaigns, for which the commercials on television that you may have been seeing lately are the first contributions by People. Limited. We are preparing others, including what we call a 'Pop Quiz.' Are there questions? The gentleman in the first row."

The man who stood up was lean, dark, and gloomy. He bit off his words as if they were bullets. "Ray Miller, UPI. You refer to these programs as educational, which implies that there is general agreement about the facts of the situation. I have two questions about this: first, isn't this, in fact, propaganda for a particular viewpoint; and second, what do you propose to do about groups, particularly religious groups, that believe there is no overpopulation problem or that to practice contraception is a sin?"

Franklin smiled sweetly at the reporter. "You always ask difficult questions, Mr. Miller. It is true that one person's education is another person's propaganda, but we have facts to back our beliefs. The proper course of action to deal with the facts is always an appropriate subject for discussion, but until those who oppose measures to limit

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population can come up with reliable data that contradicts our facts, or at least prove that our data is inaccurate, we are justified in calling our programs educational. The answer to your second question is that we must discuss these matters with religious groups as well as the general public. Morality that produces more misery in the world is inaccurately named. In any case, real opposition is not to our goals but to means, and we are not committed to any means.''

A plump woman stood up in the front row. ''Does that include the Pope?''

''Of course. Though personal discussion is not necessarily the way to go about it. And we do not mean to suggest that the Pope or the Church needs education, only that there is room for discussion. I can announce, however, that the Vatican is considering the appointment of a study group.''

A tall, older woman with graying hair stood up toward the back. ''Wilma Blanchard, *Science Review*. Do you envision or see the need for technological breakthroughs?''

''New technology is always welcome. The perfection of a male contraceptive pill, for instance. But we can't wait for it. We have the technology. All we need is the will.''

A broad-shouldered blond man stood up in the third row. ''Bruce Campbell, CBS. What is the problem then, and how do you hope to deal with it?''

''The Bible commanded us to be fruitful, and multiply, and replenish the Earth, and subdue it. Whether you believe in the truth of the Bible or Darwin or both, there was a long period in human existence when our survival as a species or as tribes or as families depended on a high rate of reproduction. The instincts that served us so well for so long betray us when the Earth has been replenished and subdued. Science has lowered the death rate and given us the means to lower the birth rate. As long ago as the 1960s a National Academy of Sciences report concluded by saying that 'either the birth rate of the world must come down, or the death rate must go back up.' How do we deal with it? There aren't any easy solutions; in fact the only solution is individual choice to do not what is instinctive but what is rational. And that means education.''

The same plump woman in the front row spoke up again. ''Doesn't that mean that the problem is insoluble?''

Franklin looked sober. ''It means that the solution is difficult. Any time we must persuade the majority of the human race to be rational, we must expect difficulties, discouragement, disappointment, and defeat. But we can't give up simply because it is difficult, because giving up is death.''

The woman went on as if she had not been listening, ''Does what you have said mean that you disapprove of the Indian solution of compulsory sterilization and the Chinese solution of surveillance and social pressure?''

''Different cultures may require different approaches,'' Franklin said. ''I'm not sure that compulsory sterilization ever was an official policy in India, and if it were I'm not sure that it or what you call the Chinese solution provide any final answers. I know they wouldn't work in this country or in most countries with a tradition of individual freedom;

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and I'm pretty sure that the only answer in the long term is individual responsibility. How one provides the individual with the information necessary to reach a responsible decision, and the means to implement it, may differ from culture to culture, but unless the necessity of limiting our family size is accepted as a truth in every culture then no solution will work. Repression ultimately breaks down, and social repression of basic instincts can only lead to the destruction of the society that represses them."

A short pudgy man in the fifth row stood up. "Harry Hopper, Associated Press. Isn't it true that overpopulation is primarily a problem of the developing countries, and, if so, aren't your missionary efforts wasted on people who already are converted, so to speak?"

"In terms of population control, you are correct. The developed countries already have reached the goal of zero population growth or dropped below it. Some Scandinavian countries have expressed concern about the fact that their reproduction rate has dropped so far that their nations may be in danger of extinction. It is a fact that the only places where population has been effectively controlled have been in industrialized nations with high standards of living, and some observers have speculated that the only way to achieve a decline in population growth is by raising the standard of living to the point where everyone recognizes that the large family, useful in an agrarian society, is an economic handicap in one that is industrialized. Raising the standard of living worldwide is a desirable goal in itself, but we believe that while efforts must continue to do so we cannot wait for that to produce the desired effect."

A group of reporters were on their feet asking for the floor, but Franklin silenced them with a raised hand. "Of course population control is only one side of the problem. The other side is resources. In the presence of unlimited resources, there can be no overpopulation, and the unfortunate fact is that the developed nations, and particularly this country, consume far more of the world's resources, per capita, than the developing countries. In fact, it has been estimated that an American baby has several hundred times the impact on the environment and the world's resources of one born in India or China. We must not only limit our numbers, we must learn to live less wastefully, to use resources more efficiently, and we must find or develop new resources and nonpolluting ways to use them."

The plump woman in the front row shouted above the others, "Are you going to take this message to the developing nations? And how will they accept it from a wealthy American?"

"It will be communicated everywhere by local leaders in their own way, with whatever help we can give them."

"What is the source of your financial support?" someone shouted.

"Contributions, large and small," Franklin said. "Our brief financial statement is available as a handout at the end of this conference. Anyone who wishes to check our books is welcome at any time at the People, Limited headquarters."

"Are you married? Do you have children?"

"The answer to both is no. My bi-

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ography is available at the headquarters as well. I can't promise that the answer to those personal questions will always be no, but if the time ever comes when I can't in good conscience continue this struggle, I will step aside and let someone else take over. But my personal apostasy or keeping of the faith is immaterial. Humanity is what matters: if we cannot control our numbers, our numbers will control us. I think we've reached the end of this session. Thank you for your attention and your thoughtful questions. The world will appreciate your help in solving the single greatest problem of our time."

The audience stood and applauded as she picked up her papers and her attache case and left the stage.

Outside the building Franklin handed Johnson the attache case and asked, "How did it go?"

"I was right," Johnson said. "You were great."

She blushed, though it was clear from her tone that she had expected it. "It did go well, didn't it."

"Superbly. Nobody else could have done it as well."

"Aw, shucks," she said and laughed. It was afternoon, the day was warm, the sun was shining, and it was clear that she felt relieved and happy, and that Johnson's presence somehow made it better.

The afternoon that followed was ordinary in its details but unusual in the way they responded to it. She had several potential contributors to call upon, and they traversed the streets of downtown Washington, entering doorways, ascending elevators, waiting in reception rooms, requesting grants and gifts from philanthropists and corporate directors. Sally Franklin was good at it. She presented her requests simply and without apologies, as if she were doing the donors a favor by accepting their contributions; and, in addition, on this particular day, there was beneath her efficient and serious presentation a kind of suppressed merriment that produced an unusually generous response.

Johnson spent his time listening, though his presence did nothing to diminish Franklin's effect on her contacts. They seemed to observe the way he listened and their attention was heightened. And there was talk between the two of them, although it was mostly Franklin's talk and Johnson's listening. He was a good listener, his attention all on her, perhaps because he had no distractions, no concerns of his own, no memories to interfere with the importance of the moment.

She told him about her childhood in Minneapolis, her parents, her school days, her boyfriends, and the glorious moment when a population expert came to lecture at the University and described a future that changed her life. It was reinforced a few months later when she spent a summer in crowded, overpopulated Mexico City and then, after graduation a year later, worked in social welfare in the slums of Washington. It was then she knew what her life work would be. "Poverty would not be so bad," she said, "if it did not include children. A child without food or shelter or love, without opportunity, without hope, is enough to break the heart of the world."

Johnson's look said that it broke his heart.

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"This has been the best day of my life," she said exuberantly. "I think I owe it to you."

"That's nonsense," he said. "You've done it all."

"I must leave for India tonight. My bags are packed. Jessie will see that they get to the airport. I'm too excited to go home and sit. Let's have dinner. I'd like to spend a few more hours with you before we have to part." She laughed, "After all, with your history I might not see you again."

He did not look into her eyes. "Of course," he said.

They ate paella and drank sangria at a Spanish restaurant in an old house located not far from Capitol Hill but in an area of older homes, narrow, set close together, and now infecting each other with the disease of poverty and the stench of decay. Diners were scattered through a number of rooms, small and large, and singers with guitars and dancers with castanets and iron heels wandered through the rooms entertaining. Mostly Franklin and Johnson ignored everyone else; when they could not hear each other they waited, and when they could she continued to talk to him as if they were alone, to describe her plans, to ask for his advice and his vision of the future. "This isn't a gypsy tea room," she said merrily, "and I have no tea leaves for you to read, but perhaps we can pretend. . . ." It was clear that pretending, that getting away from the pressures of the real world, was important to her tonight.

"You will do all the things that you have planned," he said, "if you are careful."

"Careful?"

"Many things can deflect a person from accomplishment. Things can happen to change the kind of person they are or their understanding of the kind of world they live in. Or what seemed completely clear can become hazy and muddled when alternatives appear. Do you want to tell me why you've never married?"

"I've had a few opportunities," she said.

"I can believe that."

"But when I was young I didn't love any of them," she said thoughtfully, "or not enough. And since then I haven't loved any of them as much as I loved what I'm doing." She looked up at him. "Are you telling me that marriage might change me?"

"What do you think?"

"As long as I don't have children," she began and stopped. "You're saying that if I loved somebody enough to marry him I'd want to have his children. Surely that wouldn't be fatal."

"Not if you were the kind of person who could compartmentalize your life and not let the family part distract you from your goals."

"And I'm not that kind of person?" she asked.

"Are you?"

"No, I guess I'm not."

"The world could forgive a few children from a person who was trying to get women to restrict their childbearing. It might cause awkward moments and persistent questions from skeptics, but the world can overlook inconsistencies. What it can't forgive is failure of leadership."

"I'm not the only person around who can do this. I'm not even the best one

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and certainly not the most important one. If I got married and retired to domesticity, someone else would step in and carry on the fight."

"Don't deceive yourself. You are important. Without you the battle would be lost."

"That's nonsense," she said, and then her face brightened into a smile. "Oh, I see. Now you're going to give me that prediction."

"I haven't wanted to do it," he said softly, "because knowledge like this—if you believe it—can change people, too. But you are a special person, so special that it frightens me."

"Why me?" she asked. She sounded as if it were frightening her.

"I've asked the same question myself," Johnson said, "and so did Hamlet. 'The time is out of joint; O cursed spite, that ever I was born to set it right.' But there are people whose lives have the potential to affect the future more than others. They are possessed by great ideas, taken over by missions larger than themselves: Mostly the founders of religions, but there were also conquerors and kings, political leaders and rebels, occasionally a philosopher, and once in a while an inventor or discoverer who had no intention of changing the world but changed it anyway."

"But I'm not like that," she said.

"Most of them were remarkable people, driven men, some of them bitter, hard, hungry, single-minded. . . . And you're not like that. But you have the same quality of being possessed by an idea and the ability to pass your possession on to others. Your—forgive me—your remarkable beauty and your renunciation of its traditional values are a part of your total impact on the future, but more important are your concern for other people, your ability to communicate with them at all levels, your excellent mind, your dedication, and most of all your presence. You have the ability, because of who you are and where you stand, to be larger than life, to move people and change the world just by being yourself."

She said softly, "I didn't ask for this. I don't want it."

"Nobody ever asks for it, and you don't have to keep it," Johnson said, "although I have to tell you the future will be an unhappier place if you give it up." He paused and then added, "But knowing the future is not the way to happiness."

She reached across the table and took his hand. "Oh, Bill, it must be worse for you, and I've only been thinking about myself."

"You believe my strange story then?" he asked.

"How can I help but believe," she said. "Your face, your eyes, your wisdom—"

"Then believe this, too. There are other dangers, not simply to you, though that is bad enough, but to what you can accomplish. You trust people—and that is one reason for your success—but you must learn caution, not expose yourself to danger unnecessarily, have people around whose only job is to look after you."

"I thought that was the job you picked out for yourself," she said lightly but as if she was growing to like the idea.

"I've made it my job, but I may not always be around."

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"Don't say that!" she said. "I know this is crazy. I found you in an alley this morning, got you as an unwanted employee by noon, and now you've become indispensable. By tomorrow I'll want to marry you." She was joking, but there was an edge of truth to her words that made an expression of something like pain pass across Johnson's face. She patted his hand. "Don't worry, Bill, that wasn't a proposal."

She was exuberant again, and she stood up quickly. The bill had long ago been paid. "I'll race you to People, Limited. If you catch me, maybe there will be a prize."

"Sally, don't—" he began, getting up. "This is a dangerous part of town. Be—"

But she had already threaded her way between tables toward the front door, and he had to follow quickly, trying to catch up. When he reached the front door, he looked quickly down either side of the narrow and poorly lighted street, but she was nowhere to be seen. He went down the flight of worn stone steps, and hesitated at the bottom, looking right and left as if he were seeing farther than the nearest streetlight, as if he could peer past the shadowy present into the bright future. He ran quickly to the left, down cobbled pavement, through pools of darkness.

"Sally!" he called. "Sally!"

He heard a muffled sound and raced toward it. "Sally," he said, and stopped at the entrance to a dark alley between old houses. "Tommy? I know you're there, and I know you've got Ms. Franklin."

A boy's voice came from the shadows. "How you know that, man?"

"I have an unusual kind of vision," Johnson said.

"You see that, you see I got a knife at her throat, and I use it, just like that, you make a move." A vague scuffling sound came from a place about ten feet away from Johnson. "And you keep quiet, lady, or you get it now."

"Let her go, Tommy," Johnson said. "Nothing good will come of this —only bad, all bad."

"I can kill her and get you, too. Nobody ever knows. . . . How you know my name?"

"You were in the group that found me this morning in the alley," Johnson said.

"You can't see me now." The voice was hard and suspicious. It seemed less boyish with each passing moment.

"I know a great many things, Tommy," Johnson said earnestly. "I know that you come from a large family, that your father is dead and your mother is sick and your brothers and sisters don't have enough to eat."

"You a cop?" the voice from the shadows asked suspiciously. "You been keeping track of me?"

"I won't lie to you, Tommy. No, I'm all alone. I'm just a man with a peculiar way of knowing what is going to happen. And I have to tell you that the future will be very bad for you if you do to Ms. Franklin what you have in your mind."

"She everything I can't have," the boy said. "I get something. I ought to get something."

"Not this way, Tommy," Johnson said. "That's violence, not sex. All you'll get is death for yourself and a bad experience for her that may change her

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life and the lives of a lot of people. And you'll kill your mother. She'll die when she finds out what you've done. And your brothers and sisters—what small chance they have for happiness will be gone."

"Ah-h-h!" the boy's voice snarled, but a note of doubt had crept in. "How you know that stuff?"

"I told you that I have this strange vision," Johnson said evenly. "I have another future for you. You let Ms. Franklin go and tomorrow you go to the place where she works—you know where it is, Tommy, because I saw you watching it this morning—and you ask for a job."

"How they gonna let me have a job after what I done?"

"You haven't done anything yet, Tommy. Ms. Franklin is frightened, but she hasn't been harmed. She understands the kind of life you've had, the anger built up in you, the hate that strikes at anybody. You've seen her before. She's worked in this city with people who are poor and struggling. She wants to make things better."

"Why they hire me?"

"Because I'll ask them to, and Ms. Franklin will ask them."

"I show up, maybe they throw me in jail."

"What for? You haven't done anything yet. And how can you be worse off than you are now?"

"They hire me, what I do?"

"My idea is that you guard Ms. Franklin, keep her from harm. You'd be good at it. You know how it can happen. You know what to look for."

"Not like you, man."

"You have other talents. You could be something. You could make things better, not worse."

"Ah, man, you talk too much," the voice said. It sounded boyish again. And out of the darkness came Franklin, reeling as if she had been shoved, holding her throat.

Johnson caught her in his arms. "You show up tomorrow," he called after the sound of running feet. "Are you all right?" he asked the woman trembling in his arms.

She held on to him. "Yes," she said. "Yes. Thanks to you."

"He might not have done it."

"I didn't think he would do it. I've seen him around. I didn't think he was dangerous."

"Maybe he wasn't."

"I'm afraid he was."

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"Only because he was scared." He led her back down the dark street toward the lights of the busier avenue that crossed it.

"Will he show up tomorrow?"

"There's a good chance."

"You really want me to hire him?"

"It might save him. He might save you."

"I couldn't," she said. "Not after what almost happened. I couldn't stand having him around."

"Trust me," he said.

"Bill," she said and took a deep shuddering breath, "I don't want him to save me. I want it to be you. Always."

They had reached the avenue and turned now toward the brighter lights of the Capitol area and the People, Limited building. Johnson's hand tightened on her arm. "It can't be that way. Much as I would like it."

Her hand clutched his waist. "What do you mean? Because of what you did? That was a—a crisis?"

"Maybe."

"You might forget?"

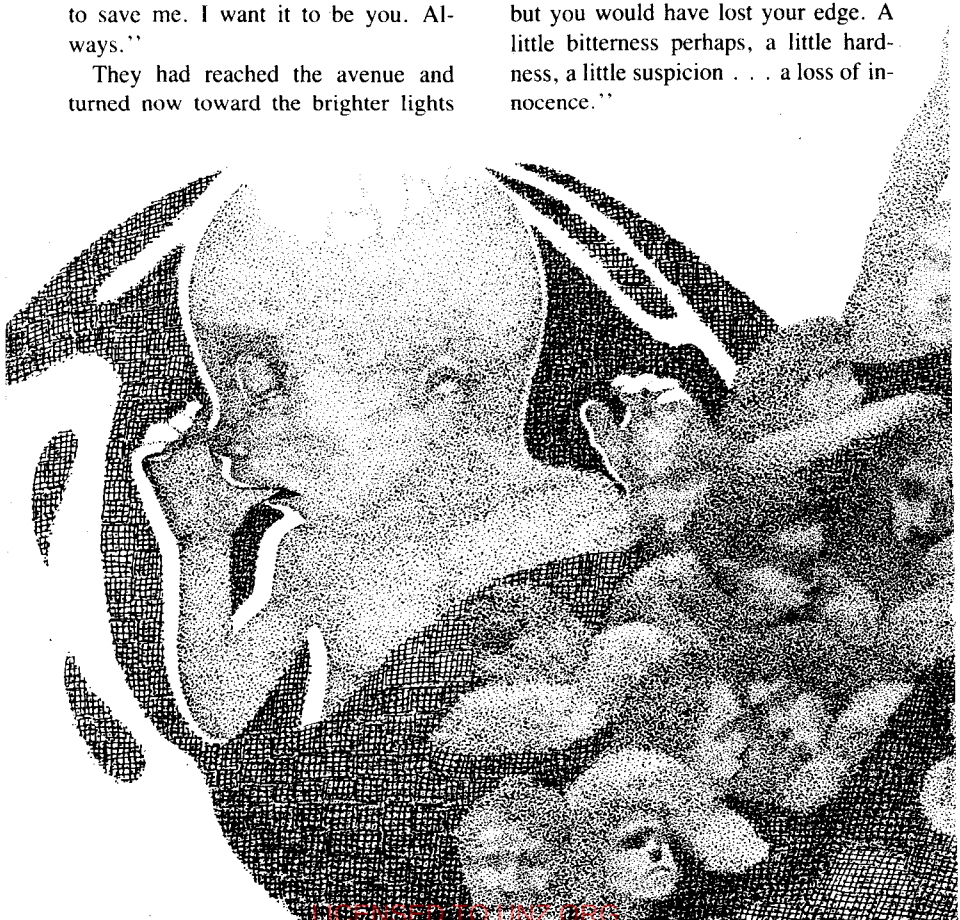
"Possibly."

"It was that important?"

"Yes."

"What would have happened?"

"It would have changed you. You would not have lost your commitment, but you would have lost your edge. A little bitterness perhaps, a little hardness, a little suspicion . . . a loss of innocence."



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"A loss of you," she said. "That's what I can't endure." She held him tightly to her side as they walked along. "You can stay. You can come with me to India. If you forget, I can make you remember. I think I love you, Bill. I know I can't lose you."

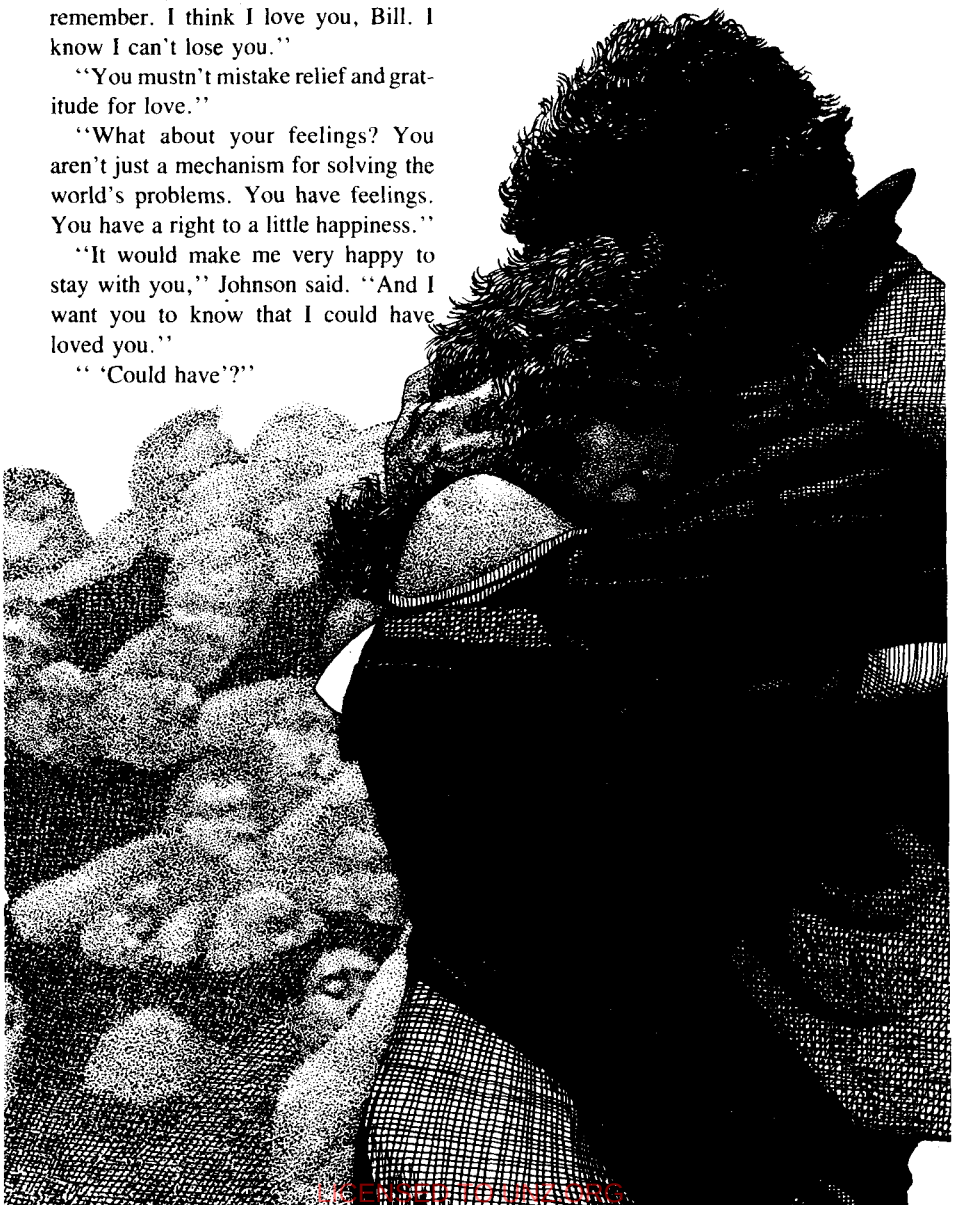
"You mustn't mistake relief and gratitude for love."

"What about your feelings? You aren't just a mechanism for solving the world's problems. You have feelings. You have a right to a little happiness."

"It would make me very happy to stay with you," Johnson said. "And I want you to know that I could have loved you."

" 'Could have'?"

"It seems to me that love doesn't happen in a day. And that's how I live my life. But it's more than that. If I stayed with you, there's a good chance we would fall in love, that you would



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love me beyond anything else, and for you I would give up everything."

"What more could people want out of life?"

"Nothing, if they didn't also know that they got their happiness at the world's expense. You see, I would know that to be my wife and bear my children—" "Oh, yes," she said —"humanity would have lost its best chance at limiting its size to a number that the world's resources could support. How could I live with such knowledge? How could you?"

"We would forget," she said fiercely.

They had reached the doors of People, Limited. "No, we would never forget. We would be happy, defiantly, guiltily happy, but we would never forget. And I would see all the evils of the world that I might have been able to do something about, and I would feel unrelentingly the need to act—and my love for you would stop me."

"Oh, Bill," she said, and pressed her head tightly against his chest.

"Go to India," he said. "Success awaits you there. You will do great things, and you will find your happiness in doing them, and the future will be a better place for the fact that you have lived. And remember—wherever you go, whatever you do, somewhere in this world there is a man who loves you if he only knew it."

Somewhere above the Pacific Ocean an airliner hurled itself toward India. Far below and far behind a bus crawled through hills toward the plains beyond. On it, by the light of a small reading light in the base of an overhead rack, a man was printing precise words with a pencil on the back of a ticket envelope.

"Your name is Bill Johnson," he wrote. "You have saved the woman who will be the single most important factor in saving the world from overpopulation, and you don't remember. You may read stories in the newspapers about her accomplishments, but you will find no mention of your part in them.

"For this there are several possible explanations. . . ."

After he had finished, he put the envelope in his inside jacket pocket, and turned off the overhead light. Now the bus was completely dark except for the faint glow near the driver. The passenger stared out at the night beyond the windows. Once in a great while a light would appear in the darkness—a farmhouse or some lonely country crossing—and then sweep past to be lost behind, while the empty miles turned under the wheels. ■

● Tomorrow, you will have to play a much more difficult piece—tomorrow, when the audience is beginning to listen for wrong notes, and you no longer have me in the wings. Then we shall see what you can really do.

Dag Hammarskjold,
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Kevin O'Donnell, Jr.

THY NEIGHBOR'S ASSETS

No matter how enticing a scheme may sound to its proponents, it won't work if the people on whom it is imposed refuse to accept it.
J.K. Potter

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As he walked up the short driveway, Elliott Bakersmith III's five hundred dollar shoes crunched gravel. Clean gravel, freshly raked in patterns striking enough to inspire guilt over their destruction. He set his feet down carefully. The sea breeze, slipping past, tickled the nape of his neck. He was surprised that it blew so far inland.

The driveway ended in a tiny backyard, where a young hibiscus tree caught the subtropical sun before it scorched some two dozen plants in small clay pots. Will Janard was turning over the strip of land before the rear fence, but he laid down his shovel and came forward with his hand outstretched when Bakersmith called to him.

Janard was a tall man, bony of rib and deep of tan, with curly brown hair and and a ready grin. "Sorry for the dirty fingers and the uh, informal apparel." He gestured to his single garment, a pair of frayed cutoffs. "I'm putting in forty bamboo orchids. Sort of to cancel out the effect of the fence. I can't stand chicken wire."

"Ah . . . yes, I'm sure." To Bakersmith, landscaping was why one hired architects, and gardeners. Small talk, though—ah that he understood. "Do wonders for your property value, too, I imagine."

"My landlord's property values, you mean."

"Well, it's still a marvelous hobby. You'll take them with you when you go, of course."

Janard shook his head. "No, I'll leave the next tenant complete instructions on their care and feeding. It's all on disk; maybe twenty minutes print-out time. Of course, if I bought the house I could spare myself the pangs of separation. . . ." He laughed.

Bakersmith stood on tiptoe and scanned as much of the adjoining yards as he could. "Driving up, it looked like a neighborhood with potential; all decent-sized houses on well-kept lots. You could find a worse investment. And if you make circuit boards as well as you grow flowers, you'll have to spend the money somehow. You'll have it coming out your ears, otherwise."

"It sounds like there was a compliment buried in there somewhere. Or two. Thank you, Elliott." He touched a plant fondly. "If I could make circuit boards as well as this azalea grows flowers, I'd own Fort Knox."

"I'm sure. And I do apologize for dropping in unannounced like this. Though I did try to call ahead—" He lifted his phone an inch out of his shirt pocket.

"And discovered my phone still hasn't been installed. They said another month or so. Which is what they said last month."

Bakersmith nodded solemnly. "One of the drawbacks of emigrating here."

"Island time?"

"Precisely." He pulled a lawn chair into the shade and filled it with the casual grace of the Ivy Leaguer comfortable everywhere. "As to the reason for this expedition: I've lined up your financing. One point four eight million, exactly as requested."

Janard punched the sky with glee. "I knew you could do it, Elliott."

"You haven't heard the terms yet."

Janard lowered his arm slowly. "How much are they taking?"

"They consented—grudgingly, mind

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you—to settle for a thirty-eight percent equity position." He paused to let that sink in. "Originally they wanted fifty-one, Will. They're skeptical."

"They're skeptical? We can deliver the board for less than it costs Mitsubishi to make it!"

"I am sorry, Will, but they won't take a point less."

Janard stared up into the cloudless blue sky. "Thirty-eight from a hundred, sixty-two, less your ten percent, fifty-two—" He squared his shoulders as if bracing himself. "It should be enough. If I don't have to sell off any more of it."

"You won't have to." He winked at his friend. "I have faith."

"Thank God somebody does . . . and thank you, Elliott, for pulling it off."

Bakersmith inclined his head in acknowledgment. "And I did earn my ten percent equity today. . . . Will, I had to put my personal credibility on the line for you. The investors feel a genuine concern about your need for skilled people, given how scarce such talent is on the island."

Janard shrugged, and sat tailor-style on the splotch of lawn. "It's like I said, I'm recruiting in California—and I won't have any trouble finding talent there, not with twenty percent unemployment."

"The investors are aware of that; they read your business plan thoroughly." He hunched forward. This aspect of the deal worried him, too. "The concern is that those people are unemployed for a good reason—that they're the least qualified."

"Oh, I'll have to screen, no question, but believe me Elliott, most of the resumes we get will be from people *with* jobs." After lighting a cigarette, he thumbnailed flakes of dried mud off his knees. "The investors don't have any cause for alarm—honest."

"Do you really think people with good high-tech jobs will be willing to give up their citizenship and come here?"

"Hey, they're not doing so well these days. The pay's down to seventy percent of what it was three years ago. So I'll offer them a better deal. Till now, the only better deals they've seen entailed learning Japanese. I mean, these are sharp people. They want the technical challenge, the high pay, the chance maybe later to go into business for themselves—but working for NEC is too much like going over to the other side. Here, though, the natives speak English—hell, half the natives used to be American—and it's sort of like turning Canadian. Same soap, different wrapper. Plus, the climate's perfect, and you get to keep most of what you make—now and forever." He brushed his right knee clean and started to work on his left. "A surprising number of 'em do think in the long term, Elliott."

Bakersmith studied his friend. "Do you regret leaving the States?"

"No more than any of you do."

"But you're not one of us." He said it with confusion, not accusation. "The rest of us spend money that's at least thirty years old, while you're still making yours. Why did you come?"

He stubbed his cigarette out on the lawn. "My father died a month before I moved here—"

"I'm sorry to hear that; I didn't know."

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Janard waved a hand gently. "I miss him more than I ever thought I would . . . but he was sixty-seven, and it wasn't sudden. He'd been sick for years. It's just that when he died. . . ."

. . . the Feds hit the house before the ambulance attendants had closed up the body bag. A pleasant looking crew, for the most part: crisply pressed suits and close-shaven faces and an overall air of keen efficiency. At their head stood an older man, balding, with jaded eyes and a skeptical twist to his mouth. "Neall, IRS Inheritance Audit Division. We're here to handle the estate."

Janard, still numbed by the impact even a long-expected passing could produce, stared helplessly at the six auditors. "I thought I just filled out a form."

The auditor released a civil smile. "Initially, yes, but Congress directed IAD to change its procedures two years ago. We issued the new regulations in January of last year. It was in all the papers."

Thus prodded, he remembered something about it. "Sure, um, so what happens now?"

Neall put his foot on the doorstoop. "There's a great deal to be done in the next few hours: inventorying and assessing all property, uncovering assets, locating safe-deposit boxes and second offices, and everything else mandated by the Inheritance Act."

"Well, his papers are all in his desk." Backing out of the doorway so they could enter, he pointed up the stairs. "You won't find much—"

"Oh?" Neall steeped up close, too close. "I hope you're not referring to deathbed dispositions."

"Deathbed dispositions?" In his fog of sorrow and pain, he did not understand Neall*l till the man flashed a look* of cynical impatience. "He didn't have anything to dispose of, just—" He raised his arms to the peeling walls, the cracked ceiling. "What you see is what you get."

"Right." Thin lips tight with disbelief, he turned to his subordinates and deployed them throughout the house.

Janard made no protest. It was standard procedure, and though he had never experienced it before, he had in the six years since the Inheritance Act read enough articles and heard enough accounts from friends to know the basics. As no spouse survived Abel Janard, and as his sole child was over the age of eighteen, everything he possessed when he died became government property.

Congress had passed the law, despite expensive and well-organized lobbying, in order to eliminate the iniquitous effects of inherited wealth, thereby guaranteeing true equality of economic opportunity. It would not happen immediately, and of course there were loopholes that the stiffening of the gift tax closed only in part, but no one expected miracles. The theory held that gradually the advantages accruing to the upper class would fade away as taxes diminished the wealth handed down from generation to generation. Ultimately, held the theory, the children of the rich and the powerful would have to compete on an equal footing with everyone else.

And as a plus, revenues received flowed directly to the Federal Budget, keeping taxes lower than they would

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otherwise have been to maintain that level of deficit spending.

"Now," said Neall to Janard again, "I'd like to examine his papers."

"They're in the desk in his bedroom." He led the way. "In here."

Neall sat in the straight-backed chair, banished from the kitchen twenty years ago just before Janard's mother died. He pulled open the center desk drawer. "Well, well, well, liquid assets in coin or currency." He held up a wad of bills and waved it at Janard.

"Oh, yeah." The old man always kept two hundred in tens in there. Just-in-case money. An old family tradition, that, stemming from the days when Janards went to sea because the land got too hot for them. "His emergency cash stash."

"Is there more?" Lips moving as he counted, Neall riffled through the bills.

"A couple bucks in his wallet, probably. Everything else is either in the bank, or his mutual fund. The papers are in one of the drawers." He took a pack of cigarettes from his pocket and lit one up.

"You do realize the exemption does not apply to cash, negotiable securities, real property or other financial assets? It only applies to personal property." Head down, he entered the discovery on his tallyboard. "You do realize that, don't you?"

"Yes." It hardly thrilled him, but it was the law. In "short-term asset" terms, it would come out close to a wash anyway. The old man had maybe ten thousand all told, most in his mutual fund, a couple thousand or so in the card account. The Feds took only what was left after final expenses. Which meant the executor would probably pay the balance due the IRS out of petty cash. "Yes, it's all quite clear."

"You don't need to bother with stopping the pension and social security checks—we handle those transactions automatically."

"Thanks." He meant for it to sound dry. It bothered him that Neall's fleshy hands rummaged through all his father's personal papers. They had remained off-limits even to Will Janard until the glaucoma had turned bad. Not that they were secret, just . . . private.

Neall touched a button on the tallyboard. A spreadsheet summarized the results of the inventory going on all around them. "You're still well below the exemption limit on personal property."

"I figured I would be." The old man's furnishings dated back to the early years of his marriage: not the hungry years, no, but the pinched years of Will Janard's childhood. It had been good enough in its day—certainly sturdy enough to endure into genteel shabbiness—but it was old, and bore all the scars of thirty years of affectionate abuse. No way it could appraise out at more than the exemption ceiling of 10K in Fair Market Value.

Janard sighed. Actually, it would be nice if the Feds *would* grab the furniture—or at least some of it. Like the moth-eaten Oriental rug worn down to its burlap fibers. And the skinny little hollow-springed cot he had slept on till college. How could he even fit all that stuff in his condo?

The auditor touched another button and glanced at the screen. "Is the prop-

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erty encumbered in any way? A mortgage, a lien, anything like that?''

''No, nothing like that.'' A year earlier, Janard had driven his father down to the bank so the old man could make the last mortgage payment in person. On the ex-due date the following month, old Abel Janard had thrown a party to celebrate his ''economic emancipation.'' Gotten stinking drunk, too, and had a helluva good time pretending he was forty years younger. ''Why?'' He reached out for the ashtray on the desk.

''Dealing with bankers adds a month to the process. Besides, they're cold as lizards. Ah, here's the deed.'' He bent down to read its fine print.

For one silent moment, while the other had his back turned, Janard shivered with selfish fury. If only the old man had signed the deed over to him. Even small houses in this neighborhood were going for over two hundred thousand. Which after taxes would have left more than enough.

But then, for some indeterminate period it would have belonged to him, not to his old man, who was the one who had worked a second janitorial job for six years just so he could meet the mortgage and Will's tuition bills both. Owning the land on which he lived, and the roof and the walls sheltering him, that had meant a lot to Abel Janard.

But still, if only . . . the proceeds would have financed a production prototype, so that when he went to the venture capitalists he would have been able to keep more of his company for himself. Assuming he could find the venture capitalists, of course. Financing had dried up, they said in the Valley.

''Your father must have been quite a gardener in his day,'' said Neall.

He raised his eyebrows. ''Yes, but how could you tell?'' The bedroom windows overlooked both the uncut front lawn, and the semi-wild flowerbeds out back.

''The running inventory shows two hundred clay flowerpots in the basement. Was he hoarding them?''

''No, he used them.'' Putting out his cigarette, he set the ashtray back on the desk.

Neall spread his hands apart. ''So where are the plants?''

''Those he didn't give away in time died.'' At Neall's expression he went on. ''He got old. Plants take a lot of attention. And a good memory. Well, the memory went. He'd fertilize the same plant six days in a row and literally burn it out. Or forget to water it at all. He had acute arthritis, too, which made it hard to repot anything that needed it.'' He gave a soft, fond laugh. ''He'd raised this clump of dracaenas in a tub. Four of them. They'd grow up past the windows, hit the ceiling, and he'd cut them back. They'd climb back up toward the ceiling—stubborn little guys—and in a couple years he'd have to cut 'em again. But the clump was too heavy for him to repot. And once his knuckles went, he stopped top-dressing them. After about twenty years in the same pot, they just gave up and died.''

''All the plants in two hundred clay pots just gave up and died?''

''Yeah, it was—'' His voice caught, but he had to tell it. ''I'd take him shopping, you know? And when I brought him back, he'd say 'Will, a small favor for an old man, if you would. There's

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a pot out back full of dry soil and dead roots. I'd appreciate it if you could knock out the dirt and put it on the shelf downstairs. I'll be needing it soon.' "

"I see." But he clearly didn't. "So there are no houseplants left at all?"

"Just Arthur's Azalea—the bonsai on the patio."

"The bonsai to which these papers of provenance refer?" He brandished a sheaf of yellowed documents. Japanese characters covered the top page.

"That's the one. My—oh, geez, he was my great-grandfather's uncle, so that would make him my great-uncle cubed, I guess. Arthur Zebediah Janard. He sailed with the fleet when Commodore Perry opened Japan in, um, 1863? He brought the plant home with him. It's been called Arthur's Azalea ever since."

"Let me just add it to the inventory—" His fingers danced on the alphanumeric keyboard. "And I will have to examine it, of course." He got to his feet.

"Right now?"

"No time like the present."

"Come on, then." He led Neall down the steps, through the living room, and out the French doors onto the weed-tufted patio. "Watch where you step. The neighborhood dogs hang out here a lot. Over here is Arthur's Azalea."

On a sturdy, waist-high stand, under a louvered roof of weathered lathing, stood an ancient, gnarled azalea two feet high. Its twisting trunk was as thick as a man's wrist; its knobby roots ran along the surface of the soil for several inches before disappearing underground. Brilliant red blossoms covered it like a cap of fire.

Neall laid the documents aside and picked up the bonsai. He appeared not to notice Janard's gasp. "My God, it's magnificent!"

"Be careful."

"Oh, I take very good care of Federal property."

He blinked. "What?"

Neall shot him a pitying look. "I'm hardly an expert, but I am an avid horticulturalist, and I know that a two-hundred twenty-seven year old bonsai azalea—trained in Tokugawa Japan, no less!—is going to bring fifteen or twenty thousand at auction."

He suddenly had trouble breathing. His tongue dried to a clumsy, fuzzy stick. "You can't be serious!"

"I'm very serious."

"But I told you—it's been in the family since 1865!"

"And you've all taken very good care of it." He stroked a blazing petal with the tip of his forefinger. "Very good care of it."

"No, you don't understand, that's not like—that's not an asset, it's not even personal property, it's the whole family's! My great-uncle Ebenezer wired this branch, and my father—"

"Your father did not irrevocably surrender title to it prior to the time when the imminence of his death became predictable." Neall tapped his right foot as he quoted the rules. "Its Fair Market Value clearly exceeds the ceiling on personal property exemptions. The IRS is taking possession of it immediately, and will serve as custodian until it can be auctioned in such a manner as to attract the highest possible bid." He turned the glazed ceramic bowl in his hands almost tenderly. His tone changed

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as he stopped reciting. "You can appeal, you know. You have five business days to file if you disagree with my on-site evaluation. Take my advice, though. Don't. I know the law; you won't win."

"But it's a bonsai! And my family's been caring for it for a hundred and forty years!"

Neall's head drew back an inch. "So? I just claimed a farm that another family had been working for two hundred years."

Janard took an angry step forward.

"That would be the height of stupidity. And you know it." But he held the bowl closer to his chest and backed away nonetheless. "If you'll excuse me, I think I'll just lock this in the van." He vanished through the French doors.

"He sounds like a total ass." Bakersmith made a face. "Bureaucrats! I've never been sure which was worse, the complete incompetents, or the ones who live and die by the rules."

"Do you know what absolutely outraged me about it all? He *enjoyed* it. He *liked* taking it away from me."

"So that's what drove you out of America?"

"Not the act, Elliott, but the mindset behind it. That glee, of course, but also . . . If you think about it, almost anything that survives intact for a hundred years is going to acquire some real-world monetary value. It's inevitable. Look what antique furniture brings. Or Spanish-American War Medals. Or comic books, for god's sake. But things like the azalea are totems, not assets. Something that a family treasures for four generations is an asset only in the spiritual sense."

"Yes, of course, but that's your mindset. What about—"

"Theirs?"

"Yes."

"To them, it's wrong for a family to accumulate wealth. As though wealth existed in and of itself, and there's never going to be any more of it so you have to gather up every bit of it and then spread it around evenly." He fumbled for his cigarettes, and made a disgusted noise when he found the pack empty.

Bakersmith shook his head. "What does that have to do with the bonsai azalea?"

"Elliott, a gold mine isn't wealth, it's just a fair-sized hunk of rock with holes in it. People *create* wealth by mining the gold, and refining it, and putting it into circulation."

"Simple economics. But the bonsai—"

"We nurtured it for a hundred and forty years. Not one of us, but all of us. We created a work of art that improved with age. Because that's what life's all about, making what you have better for whoever takes over for you. But the catch is, as it gets better over time, it acquires value. So now, when the caretaker dies, society says hey, the next one in line can't have it because that would give him an unfair advantage. They're sick with jealousy, you know? Their families didn't leave anything of lasting worth, so they want to strip the lucky ones of their good fortune."

"Given my present citizenship, I'd be a hypocrite if I disagreed with you."

"Well, what scares me is, what's the next step? I mean, how many guys in the NBA make a cool million a year because their parents handed on genes

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for height and muscles and good reflexes? Do we equalize that with DNA surgery? Or with a chain saw at their knees? And you know what a top model makes? Ten, twenty thousand a day. Those looks are inherited. Why not make everybody look the same, too? I mean, what this whole populist definition of fairness, of equality, comes down to is, if I don't have it, you can't have it either. And that's a perversion of democracy." He stiffened, and shook himself. "I'm sorry, I wax passionate on that theme."

"With reason, I think," said Bakersmith. "But at least you've replaced Arthur's Lost Azalea."

"Elliott, you can't replace something like that."

He flushed. "Poor choice of words, I admit it. You've found a new one to care for, then."

"Not in the least. It's Arthur's."

He looked at the triumphant old plant with puzzlement, and with new respect. "But I thought you said—"

"Ah, well, Neall shouldn't have left the provenance papers on the patio like that. I'm a smoker—"

"And you should quit. Your chances—"

"I never go anywhere without my butane lighter." He brandished it, and flicked it into flame.

"You burned them?"

Janard merely smiled.

Bakersmith's brow clouded. "But still, he had the plant, and it was a Japanese-trained bonsai and it was all those centuries old."

"Sure, he had the plant—but did it really come from the castle of the shogun? Or from a nursery down the road? Without the papers, Neall couldn't prove it either way—wouldn't dare try to claim anything different. All he could say, legally, was that it looked like a very old azalea. But how old was it, actually? Gardeners do, after all, exaggerate now and then. . . . The only sure way to tell would be to count the rings—which would effectively destroy any value it had."

"Clever, clever indeed. And remarkably quick thinking. But now you can't prove its provenance, either."

"What proof do I need? I don't need a piece of paper saying a Tokugawa shogun touched it. Up here—" he tapped his head. "—and down here—" He touched his heart. "—that's where it is, that's all I need. I remember traveling to uncle Ebenezer's to watch him repot it. I was maybe four years old. When he was all done, he quizzed my father, and then gave it into his care. I remember my mother teaching me how to water it, my father's hands guiding mine when he showed me how to train it. That's all I need, Eliott."

Bakersmith stayed silent for a while, his gaze on the bonsai. "You know, two years ago I hired an economist to do a study, and he claimed that a hundred thousand families, with an average net worth of a million each, had left America for good. Close to half of them came here."

"I know. That's why I'm here instead of somewhere else."

"From the very beginning I expected that much capital to flee the country. It was so damn predictable. But somehow, I never dreamed that beauty would be leaving, too."

"It goes where it's appreciated, Eliott." He brought Arthur's Azalea into the sun, and made a noise of satisfaction. "Everything goes where it's appreciated." ■

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Timothy Zahn

MUSIC HATH CHARMS

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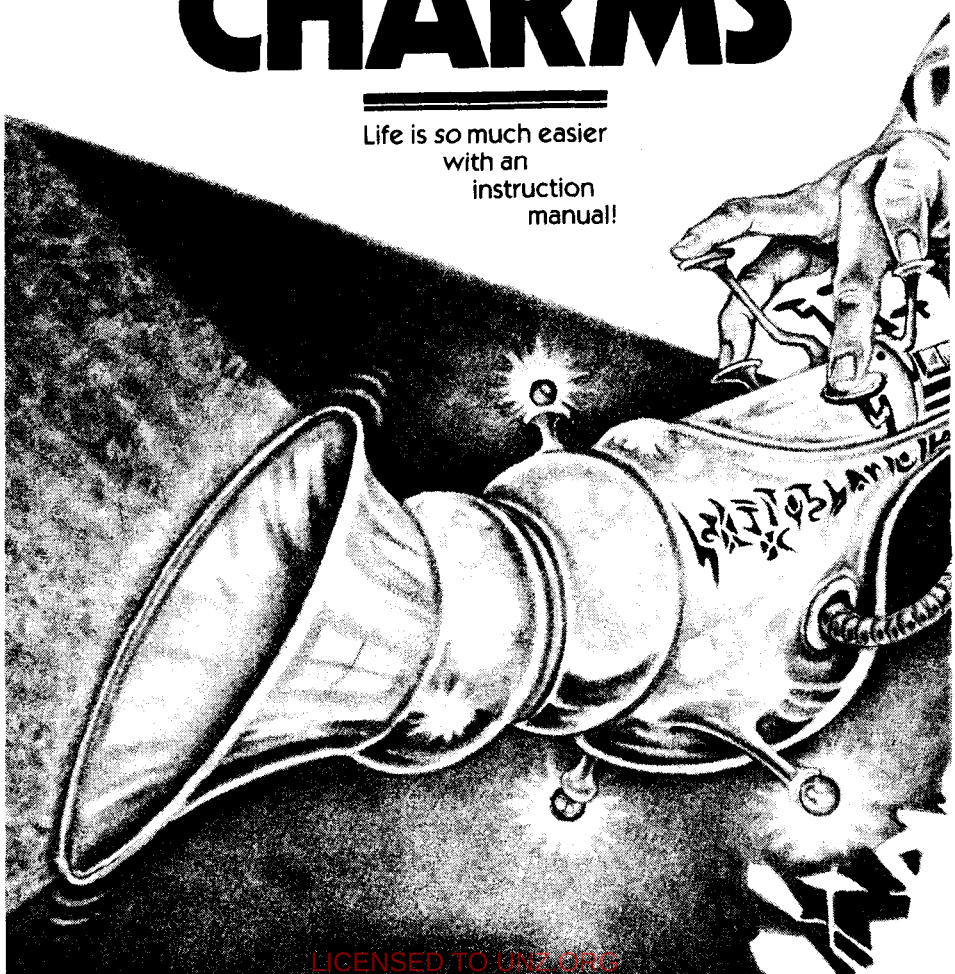

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"Oh, look, Jaivy! Spars and his Demonflute are on the news!"

I sighed and poked one eye over my filmreader. Eleni, almost bouncing in her excitement, was pointing at the screen. Sure enough, there was Spars, dressed to the hilt in the standard colander haircut, body paint, and idiot grin of a Thwokerjag performer—a look, I'd often thought, probably attained by dressing quickly in a dark swamp. Clutched in his hand was that monstrosity of an instrument he'd dug out of some ruins on Algol VI a month ago. "I still say it looks more like a clarinet," I commented, focusing on the Demonflute as the more photogenic of the two. A clarinet, that is, with a lopsided bulge in the middle, a strangely shaped and oversized flare at the end, a truly terrifying key arrangement—well, anyway, it looked even less like a flute.

"No one *cares* what it looks like," Elini chided, her eyes still glued to the screen. "It's the neat *sound* that's gonna start Thwokerjag zooming again."

"You've *heard* it?" I asked, ignoring for the moment the musical tragedy that a Thwokerjag renaissance would signify.

"Sure—he was practicing downstairs when I went over to see Ryla yesterday. It sounds kind of like a chirper, only shriller. I'll bet it'll really knurl the neurons when he plays it with the amp tonight at Moiy's. I still think you could've gotten us tickets if you'd tried."

"Starguard preserve us," I muttered. "A shrill chirper and some idiot sold him an amplifier to go with it? Aren't there laws against abetting physical assault?"

"The amplifier's built in," she said, ignoring the dig. "It's in that bulge in the middle—that's what makes it so heavy. You don't have to plug it in, either—Ryla said it pulls energy from cosmic radiation or somewhere. Neat, huh?"

"Very." My half-formed fantasy of protecting the city by knocking out its power stations slid off into oblivion.

Spars had been replaced on the screen by someone else, and Eleni turned the full force of her Patient But Annoyed expression on me. "Y'know, I really don't understand how you could have spent your whole life here without at least being willing to give Thwokerjag a try. I mean, it all *started* here."

It had indeed; and it had singlehandedly raised Haruspex from total obscurity to a status of genuine distaste among music lovers throughout the galaxy. From here Thwokerjag had swept outward to the other worlds of the Great Republic, inciting whole teenage populations as no other movement before it. For a while it had looked like it might bury even Neodisco beneath its onslaught . . . but even as sheer size slowed its momentum an unexpected resurgence of Classical Impressionistic Rock dealt it a blow that had ultimately proved its undoing. Now, only on Haruspex was Thwokerjag the dominant musical force, and even here a more classically oriented person like myself could find concerts and records that suited my taste.

One eventually got used to feeling like a fifth columnist.

"I appreciate your patience with me," I told Eleni, hoping the implication that I might convert someday would sidetrack the otherwise inevitable ar-

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gument-*cum*-recruitment pitch. "If you're finished with the news, why don't we grab the trans and go downtown for dinner?"

"Sure. Let's eat at Moiy's."

"You don't give up, do you? Anyway, I told you before that I couldn't get tickets." I passed up the obvious comment that if she were as well glommed onto the fringes of Spars's group as she thought she was, a brace of free tickets ought to have been forthcoming.

She sighed theatrically and got her coat, and a few minutes later we were on the inbound trans. As we sat there I found my mind drifting toward the Demonflute. The name itself, I guessed, was a product of Algol's "Demon Star" nickname and Spars's limited imagination. As far as I knew it was the first musical instrument of alien design ever found, and while I deplored the use it was about to be put to, that was hardly its fault. "Ele, you didn't by any chance get to see the Demonflute up close, did you?"

Eleni turned from her contemplation of the holo-ad drifting past our noses. "Sure. Spars let me hold it, even."

So she was deeper into Spars's friend-stack than I'd thought. My opinion of the group went down one more notch: no free tickets for anyone, apparently, when a concert looked to turn a profit. "Can you describe it for me?"

"It's about yi by yi," she said, indicating sizes with her hands, "with a sort of flat mouthpiece and eighteen separate keys. The end—the far end, I mean—swivels a little, probably so you can change how you're holding it and still point the music at the audience. Um . . . it's made of a coppery sort of metal with some neat curlicue engraving down one side. Spars says it's at least three hundred years old, and that it says a lot about Algolite technology that the amp is still working."

And the fact that they'd made a gadget that sounded like a shrill chirper said a lot about their musical tastes, too, I told myself silently. No wonder the race had died off.

But I didn't care nearly as much about the late denizens of Algol VI as I did about what the Demonflute was going to do for Thwokerjag. I wasn't all that well-versed in musicology, but I *did* know that new instruments had often revitalized movements that were supposedly on the decline. Until Classical Rock or Canton-Nadir could adapt the Demonflute to their own music, Thwokerjag would have the edge in impressing the pocket change out of the billions of novelty-seekers out there. Of course, if someone started duplicating Demonflutes fast enough the power balance would remain essentially unchanged—

That is, if anyone *could* duplicate the thing. For all I knew, the Demonflute could have a tone/texture mix that even the best synthesizer couldn't handle.

A unique instrument in the hands of Spars and Thwokerjag. It gave me cold chills just to think of it.

The passageway door ahead opened and one of the security guards strolled through, eyes alert for trouble. I winced slightly as he passed me and the flared nozzle of the Peacekeeper in his belt almost brushed my ear. Call me paranoid, but I've never liked the idea of some overeager junior lawman being able to turn my legs to putty with instant

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subliminals. Sure it's humane, but I prefer to *know* when someone's telling me to stop or—

My trans of thought froze on its rail. Turning quickly, I got one more look at the guard before he left the car. There was no mistake: the nozzle of his Peacekeeper looked exactly like the flared end of the Demonflute.

Eleni was looking at me questioningly. "Ele," I said, choosing my words carefully, "why did Spars conclude the Demonflute was a musical instrument?"

Her eyebrows lifted a fraction. "Because when you blow into it music comes out?" she suggested, obviously waiting for a punchline.

I shook my head. "Not necessarily. *Sound* comes out, all right. But sound comes out of lots of things."

She rolled her eyes skyward. "I hate it when you get all abstruse like this. What, in plain English, are you driving at?"

"Could the Demonflute be the Algolite version of a Peacekeeper?"

She looked at me as if I'd sheared a pin. "You mean with all that subliminal suggestive stuff? Don't be silly. The group's been practicing with it for a month now. Nobody's gone frizz-brained yet."

"Has Spars tried it with the amp?"

"No-o-o," she said slowly. "They've checked to make sure the amp works, but I think that was all done electronically. I don't think he actually played it during the tests."

"Who would build a musical instrument with a built-in, self-contained amplifier?" I continued. "And you said yourself it sounded like a shrill chirper. A chirper alone is already playing close to the uppersonic frequencies a Peacekeeper's message comes in on."

"Wow," she breathed. "You mean the whole audience at Moiy's is going to be wide open to suggestion tonight? Thwokerjag really *will* be on the way back up."

"Maybe," I said, suppressing a shudder at that idea. "But only if the uppersonic carrier is the only part still working."

"There'll be interstellar tours again—what? What do you mean?"

"A Peacekeeper doesn't just set up a suggestive state, you know. It beams in a prerecorded capitulation message."

Eleni could be as dense as hullmetal when she wanted to be, but I could see by the look on her face that she'd picked up on this one fast enough. "But the Demonflute would have an Algolite message in it. What would it do to humans?"

"I don't know, but I'm not sure I'd like to find out first-hand."

"We've got to call the cops," she said, fumbling for her phone. "Or try to talk to Spars or—"

I stopped her. "We haven't got even a shred of evidence," I pointed out. "Until we do no one's going to waste ten seconds listening to us."

"What kind of evidence can we possibly get?"

"Well . . . you said there was some engraving on the Demonflute, right? Could it be some sort of writing?"

"I suppose so. But I can't even remember what it looked like."

"You won't have to." The trans was slowing down, and I took a quick look out the window to see where we were.

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"Come on," I said, grabbing Eleni and hauling her all but bodily out the door.

"This is where we get off for Moiy's," she said, looking around her as she rubbed her arm. "I thought you said we couldn't tell Spars yet."

"We're not going to. This way; come on."

The library was only two blocks from the trans station. Once inside, I pulled a copy of the newstape Eleni had been watching earlier and we ran it through a filmreader to the spot where Spars had been showing off the Demonflute. Moving the tape frame by frame, I finally found a shot that Eleni said was at the right angle to see the engraving. Jiggling the controls to keep the Demonflute centered on the screen, I ran the enlarger to its limit.

"There," Eleni said, pointing. "His hand's covering about half of it, but you can see the last few squiggles."

"Okay. Go find us a computer terminal while I get a hard copy of this picture."

It took a few minutes for me to get my photo and join Eleni at a terminal. We then spent the better part of an hour programming the machine to scan the engraving in the picture and compare it to any previous data on Algol VI languages. I wasn't sure any such information even existed, but it seemed unlikely that anyone would have let Spars poke around those ruins unless the archeologists had already been there and gone. The computer seemed to agree with my logic, informing us there would be a short wait while the proper files were located.

I leaned back in my chair and tried to relax. It was already seven fifty-eight, my watch told me, which meant Spars was due on stage in two minutes.

"Don't worry," Eleni said as I muttered something evil under my breath. "No Thwokerjag performer ever goes out on time."

"I hope they goof up his body paint and have to do the whole thing over," I growled. "No telling how long this is going to take."

"Jaivy," Eleni said after a moment, "if the Demonflute really is some sort of Peacekeeper, why did Customs let Spars bring it here?"

I shrugged. "Customs is so overworked these days that about all they can look for are drug smugglers and tariff jumpers. Spars probably just walked in, waved the thing under their noses, and walked back out again. He'd never get away with that on Earth or Vega, but out here in the boons everything's a lot slacker."

"Yeah." Abruptly, she stood up. "I'm going to go talk to the librarian, see if he can speed things up any."

I gazed at the viewscreen for a long minute after she left as new and unpleasant possibilities began to multiply in the back of my mind. What if it *hadn't* been simple incompetence that had turned the Demonflute loose on Haruspex? Could Customs have learned of its function while examining it and deliberately let it through? It seemed crazy . . . but there were a lot of people who missed the days when Haruspian Thwokerjag dominated music in the Great Republic . . . people who might be willing to do anything to see that power regained. If Eleni was right—if it turned out that only the uppersonic carrier remained of the Demonflute's

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original programming—then the hard-core fans at Moiy's tonight would leave there with Thwokerjag just a bit more firmly a part of their psyches. A few more profit-making concerts—some publicity—revived curiosity—and Thwokerjag would indeed be on its way back to the top.

And if some of the recorded Algolite messages *did* remain, the whole audience could wind up the evening by painting each other's feet orange.

Which, for all I knew, might add that much more to Thwokerjag's appeal.

Abruptly, the *standby* symbol vanished from the screen. I glanced around quickly without spotting Eleni, then hunched forward to read. The Algolite language, I was informed, wasn't completely deciphered yet; but the probability was greater than ninety-five percent that the word on the Demonflute was *ezt'ghic*, a verb-adjective form meaning—

Maker/causer of death.

I stared at those four words, listening to my heart thump and my theories crumble into kitty-litter. This was no simple opinion swayer—Spars had dug up a bona fide lethal *weapon*.

And brought it to the stronghold of Thwokerjag.

To play in front of Thwokerjag's most ardent followers.

My suspicions about official collusion did a fast and frightening backflip. Far from secretly supporting a Thwokerjag revival, could someone in power have decided to end it once and for all? And if so, what would happen to me if I got involved any deeper than I already was?

For that matter, where did my own sympathies lie? Didn't I, too, want to see Thwokerjag wiped out?

And then Eleni appeared around the corner a few booths away. "Anything yet?" she stage-whispered, hurrying toward me.

My finger was bare centimeters away from the *erase* button. The screen could be blank before Eleni was close enough to see. . . .

"It's even worse than we thought," I told her. "Take a look."

She did, and her jaw dropped. "Maker of *death?* Jaivy—does that mean what I think it does?"

"Yeah," I said, snapping off the terminal. "And we've got to stop Spars before he wipes out Moiy's whole place. Do you have the number for anyone in his group?"

She was already punching phone buttons. "I'll try Ryla. . . . Come on; come *on* . . . They must already be on stage, Jaive. We'll have to call the cops."

Practicalities—and lingering questions about official involvement—forced my decision. "No. We can be at Moiy's faster than we could explain this mess over the phone. Come on."

We ran the entire five blocks and arrived at Moiy's gasping for breath. One of the least seamy of the cheap-food-ditto-entertainment type of place favored by Thwokerjag adherents, Moiy's covered nearly half a block and I had to pause just inside the foyer to orient myself. Spars would be performing in the main dining room, just ahead of us. One of the side doors might get me to the stage without having to run the entire maze of tables. Eleni beside me, I

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headed toward a likely-looking corridor.

"Tickets?" Like magic the ticket taker appeared in our path. From his size, I guessed he also doubled as a bouncer.

There was no time to explain, even if I'd had the breath to do so. "Gotta stop Spars," I gasped; and as he frowned, I ducked under his arm and tore down the hall. Reaching my target door several steps ahead of him, I yanked it open and dived into the cacophony of Thwokerjag at its worst.

And found I'd miscalculated. The door I'd come through was still ten meters from the stage, with several tables between Spars and me. But even as I started to thread my way through the screaming fans, I saw I was too late. The back-up men on chirper, Omni-Chord, and xyloplane had brought the music to a fever pitch and Spars was raising the Demonflute to his lips.

There was no way I could get back out of the room in time. I froze in place, my eyes riveted to that swivel flare —adjusted, I saw, to sweep the audience at eye-level—and with a sick feeling in my stomach watched Spars start to play.

It was the most hideous sound I'd ever heard. Eleni had called the Demonflute a shrill chirper, but she'd been entirely too charitable—the damn thing sounded more like a banshee in heat running cats through a paper shredder. Spars played over a whole unearthly scale, hitting notes that must've grounded every bat for fifty kilometers. The noise went on and on . . . and suddenly I noticed I was still alive.

I looked around the room, dumfounded. Everywhere the Thwokerjag fans were swaying and clapping with the beat, just as they always did. Unless the Demonflute killed by inducing St. Vitus's dance it didn't seem to have any effect on them at all.

I was still standing there like an idiot when the bouncer finally caught up and carried me unceremoniously from the room.

The bouncer was pretty casual about the whole thing, and once he learned that Eleni was an acquaintance of Spars's he even let us wait in the foyer for the end of the concert.

"I just don't understand," Eleni complained as we collapsed into chairs. "Did the computer goof?"

"I doubt it." I felt like a ribbon-winning moron. "The engraving was probably a pet name the original owner had for it—you know, like the way you call your cycle the Boneshaker."

"Or a model name, like the Nissan-Lockheed *Sunjammer*." She giggled with released tension. "Imagine some alien trying to make sense out of *that*."

"Uh-huh." But the issue wasn't settled yet, I knew; not by a long shot. If the Demonflute wasn't a killing weapon, then maybe we were back to the Peacekeeper idea—and if that blipped out, it would just mean looking somewhere else for the answer. Because the Demonflute *wasn't* just a musical instrument, and I knew I wouldn't rest until I found out what else it really was.

Eleni broke into my musings. "You could've gotten killed in there," she said quietly, taking my hand. "You risked your life to try and save people whose music you don't even like."

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I shrugged, feeling a little uncomfortable in the role of hero. "People are people, no matter what their tastes are."

"Hard to argue with that," she conceded.

A motion off to the side caught my eye, and I looked up to see old man Moiy himself wander into the foyer. He was bent over strangely, his eyes on the floor, and for a moment I wondered if he was sick. But just then he noticed us and bounded over, beaming happily.

"Good evening," he said. "I trust you're enjoying the show?"

From his words and attitude it was obvious he'd mistaken us for paying customers who were taking a breather. Eleni apparently shared my thought that there was no point in disillusioning him. "Uh, the Demonflute's an unusual instrument, isn't it?" she said.

Moiy nodded vigorously. "A remarkable sound; just remarkable. That boy is welcome back any time he wishes. Remarkable!"

"You mean you *like* that racket?" I blurted without thinking.

"Just between us, the music makes my teeth hurt," he confided, winking. "But who cares? The kid and his whasis have done something me and City Health have been trying to do for years."

"Oh? What?"

"Why, look around," Moiy said, waving toward the corners of the foyer.

Where he pointed, I noticed for the first time, were some black spots scattered on the floor. With a strange feeling in my stomach, I looked back at Moiy.

Still beaming, he nodded. "Greatest little exterminator I've ever seen. Killed every single cockroach in the place." ■

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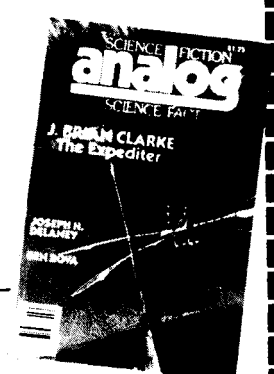

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Utopia Hunters, Somtow Sucharitkul, Bantam, $2.75, 288 pp.
Starsilk, Sydney J. Van Scyoc, Berkley, $5.95, 245 pp.
The Man Who Melted, Jack Dann, Bluejay, $14.95, 280 pp.
The Years of the City, Frederik Pohl, Timescape, $15.95, 335 pp.
Chanur's Venture, C. J. Cherryh, Phantasia, $17.00, 201 pp.
Ties of Blood and Silver, Joel Rosenberg, Signet, $2.75, 177 pp.
The Night of the Ripper, Robert Bloch, Doubleday, $14.95, 231 pp.
It Came from Schenectady, Barry B. Longyear, Bluejay, $15.95, 352 pp.
Phoenix in the Ashes, Joan D. Vinge, Bluejay, $14.95, 256 pp.
Watchers at the Strait Gate, Russell Kirk, Arkham House, $14.95, 258 pp.
The Fourth Dimension: Toward a Geometry of Higher Reality, Rudy Rucker, Houghton Mifflin, $17.95, 223 pp.
Mutual Assured Survival, Jerry Pournelle and Dean Ing, Baen Books, $9.95, 256 pp.

Give us a fanfare, please, Maestro. We have here a major event for the science fiction world, a new novel from the desk of Samuel R. Delany. It's **Stars in My Pocket Like Grains of Sand,** volume one in a "dyptych" whose second entry will be *The Splendour and Misery of Bodies, of Cities*. It's a magnificently intricate work of the imagination, an awesomely ambitious extrapolation of the human condition, a book to make other writers weep with envy.

Unfortunately, it will make the readers weep too. The overall effect is less like a pocket full of sand grains than a shoefull of the abrasive things.

The story begins well enough. Delany shows us the world Rhyonon, where the petty criminal Korga undergoes a brain manipulation known as radical anxiety

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termination, or RAT. Rat Korga, as he is thenceforth known, becomes a mindless husk, a slave who must be constantly instructed in his simple duties. His world sees him as something less than an animal and treats him accordingly. But then Rhyonon is destroyed, and Rat Korga is the sole survivor.

Delany then introduces us to Marq Dyeth, whose job_1 is to negotiate various matters for a series of $employers_1$ and whose job_2 is to explain the history of his family's wondrous home in Morgre on Velm. I kid ye not about those subscripts, nor when I say that Marq's mother is an evelm, a dinosaur-like alien. Children enter his family as more-or-less adopted embryos of either species. Sexuality is totally dissociated from reproduction, and it shows, for Marq's sexual preference is for big, brutish men who bite their nails. In fact, his sexual ideal is precisely Rat Korga, whom he has never met, at least until a manipulative official of the Web, the network of information and relationships that rules the stars, sends Korga his way for a day.

Better—or worse—yet is what Delany does to liberate our language. He has solved the gender problem by making "she" and "woman" neutral, applied to anyone of either sex, and by using "mother" for either parent. "He" and "man" are reserved for sex objects of either gender. The result of this, and of the Dyeth-Korga liaison, is a story whose pervasive sexuality is bound to get it thrown out of any school it might penetrate. Note that I am *predicting*, not recommending.

The gender bit hints at massive, drastic changes in humanity's social history. Those changes have other effects in Delany's world too, but perhaps not as many as we might expect. Delany seems to use the words to make an ideological point, not a reasoned extrapolation. And when he gives different human groups drastically differing body languages, he seems arbitrary, complicating for the sake of complication. By denying what we understand today as human universals or near-universals, he also denies the obvious kinship of his human characters with those we know. He belies the evidence of the speeches and thoughts he displays for us.

But I am being superficial, beating the surface of his tale to a froth. What is Delany really up to? It seems to me that he shows two major concerns. One he calls "cultural fugue"; it is the effect on a world of too much alienness—social order breaks down, and the world dies. Call it an extreme example of culture shock, and you have it by a name we know.

His second concern is to identify intelligence with information. Once Rat Korga has lost his anxiety, he has also lost all initiative. He can no longer think for himself. This changes for the first time when he is bought by a female pervert who equips him with a glove that links him to a computerized information source. All questions answer themselves, and he can now resemble an intelligent human being quite closely. The resemblance improves after his rescue from dead Rhyonon, when he is linked to the Web and its much vaster supply of information. When he meets Marq Dyeth, he is distinguished mostly by his reserve. He is whole enough to play an equal part in their brief love affair, and potent enough—in a totally mysterious way—to be the center of vast forces of destruction.

There are surely other concerns as well, but those two stand out for me. I might see the others if Delany's grains of sand—homosexuality, pronouns, and more—didn't irritate my tender sole so

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much. Or there may be less real substance than even I can see. One of these days, maybe, I will learn to tell empty flash from real; as things stand, I can only be wary when a writer, a philosopher, a sociologist, a politician or political scientist, or a—you name it—tries to impress me with verbal pyrotechnics. I wonder if there is less in his words than he wants me to think, and usually rightly.

Yes. I *am* suspicious of Delany.

> ". . . though we speak of good and evil and of absolutes, it all comes down in the end to only a few people, frail, bewildered, afraid of the dark."

I take this line from near the end of Somtow Sucharitkul's latest epic of the Inquest, **Utopia Hunters,** for it says something fundamental about that much cited literary grail, the human condition. It makes a point that too much SF misses entirely in favor of the view that history is made by pivotal figures, heroes. Delany thus doesn't miss the point, while Somtow seems to make a liar of himself.

Utopia Hunters is the story of Jenjen, a young woman who first meets the Inquestor Ton Elloran as a girl and learns of darkweaving, the knitting of strands of light into such a tangle that all seems dark and buried images reward only prolonged scrutiny. When she becomes a lightweaver, dedicated to less opaque artistry, Ton Elloran returns to bid her into his palace. There she hears tales of the Inquest's history and its dedication to the elimination of the utopian dream, that humanity may ever progress. She hears of Ton Elloran's own history, of Ton Kelver's efforts to smash the utopia that is the Inquest itself, and she witnesses the smashing of worlds. She learns, she matures, and in the end she is no longer the artist she once had been.

The novel satisfies, but it is by no means the end of the Inquest. Somtow has yet to tell us how this monumental institution falls, and if he hews true to form, he will need several volumes to do the job. At least one of those volumes will surely show us Jenjen's own pivotal role in the collapse.

Let me call your attention to the bits of verse with which Somtow heads the various parts of this book. Attributed to the "Songs of Sajit" (Sajit was a musician buddy of Ton Elloran), they are written once in English "translation," once in the transliterated tongue of the Inquest, and once in a peculiar cursive script. The script, I think, is meant to resemble Thai, perhaps as homage to the author's birthland, but I am not at all sure that it is genuine Thai. There is a character-by-character correspondence with the transliteration into Roman letters, as there might well be, but careful study of the cursive characters reveals that they are strikingly familiar. Each one is a modified and ornamented version of the Roman.

Somtow just may be having us on. On the other hand, his alphabet *is* prettier than our version.

With **Starsilk,** Sydney Van Scyoc ends her *Darkchild* trilogy. The star is Reyna, daughter to the sun-wielding barohna Khira and her mate Iahn, that information-gathering clone of the vanished explorer Birnam Rauth, creature of the Benderzic, who sell their data to the world-rapers, freed of his bondage by Khira. Reyna's sister has vanished on her quest to the mountains, where she had hoped to kill a beast and spark her own transformation into a barohna. Reyna faces her own quest, but the Arnimi, alien scholars who dwell in Khira's palace, have learned that the transformation happens only for girls whose brains have a certain novel feature, and

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neither Reyna nor her sister have the novelty. Doomed to failure and death, Reyna nevertheless insists on her right to a quest.

In *Bluesong*, volume two of the trilogy, Birnam Rauth's voice turned up, recorded in a length of silk, sounded by wind and sun. The silk engenders visions too, and the visions have now been interpreted to locate the world where the silk was made and where, presumably, Rauth is incarcerated. It is now time to seek Rauth, and Khira and the Arnimi send Reyna on the mission, together with the hunter Juaren, Khira's mate of a season, and the Arnimi woman Verra.

They find the planet of the silks. Its denizens are catlike creatures who live in bowers of singing silks. There are humanoid spiders that spin the silks and impress in them, somehow, the souls that give them life. There is the unseen, dwelling deep in the forest, source of silksouls. There is an ecology that makes sense in a very local way. And there is a strong sense of alienness that must be overcome before Birnam Rauth can be freed, transformed as no barohna ever was. And then there is a new mission, to awaken Reyna's people to the perils and opportunities that flit among the stars.

Starsilk wraps up the trilogy warmly, humanely, and effectively, though it does leave room for more books. It is also a good tale by itself, and I recommend it. It and the trilogy are quite suitable for adult readers, but because of the ages of the protagonists in the three books, the trilogy may be best for teenagers, especially girls who need a stimulus to nontraditional ways of being. Van Scyoc's heroines are humans before they are women.

One portion of Jack Dann's **The Man Who Melted** appeared earlier as "Blind Shemmy." Another appeared too, but I fail to recall the title and the novel doesn't say. But it doesn't matter, for the novel is satisfyingly potent and emotionally draining, despite a sometimes bewildering mysticism. I enjoyed it much more than the Delany book.

Dann's future is on the verge of chaos, thanks to the Screamers, who —perhaps because of a virus —periodically scream through the streets, destroying and killing and telepathically shanghaiing bystanders into their plight. Hero Ray Mantle lost his wife to the horde, and now he is obsessed with finding what happened to her. He believes she lives, for he has gone to a sect that believes the Criers—as it calls them—are holy and worships by using electronic telepathy to tap the brains of dying Criers. Believers then link with both the living Criers on Earth and the world of the dead. They sense Godhead, and they eagerly await the day when all humanity Screams at once. Mantle senses madness, not God, when he hooks up, but he also hears his wife calling him.

He has help in his quest from a woman who loves him and from a guilty, manipulative, journalist friend. He succeeds, too, but I will say no more about the plot. It is enough to say that, for once, the blurbs the publisher pried out of other writers are not far off the mark. Zelazny calls the book "powerful and fascinating . . . almost hypnotic." Malzberg says, "stunning; a dreamlike, sinking odyssey of love and redemption." Silverberg says, "fierce, unrelenting, enormously powerful . . . compelling and unforgettable . . . the finest work so far of one of the most gifted and penetrating science fiction writers of the 1970's."

I won't argue.

Frederik Pohl's **The Years of the**

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City gives us the rest of what "The Greening of Bed-Stuy" and "The Blister" promised in these pages: the future of New York City, from the day "When New York hit the fan" to the day when anyone can be a member of the Supreme Court. You get drafted for public service, you see, and if you've got the sense and the smarts, that's your assignment.

Pohl creates a utopia in the old tradition here, and his purpose is to show it to us. I wish I could believe it, for it is a lovely one. However, it is too strongly based on the powers of sweet reason. His basic mechanism is the Universal Town Meeting, the use of TV and radio to debate a controversial issue, with random polling of the citizenry and electronic consensus. He gets UTM accepted well enough by having it started by a potent right-to-lifer (who ironically favors the death penalty) as a propaganda device, letting its prime exponent object to its bastardization, and then having the powers that be say, "If we try this thing out, we don't want somebody saying later that we didn't give it a fair chance. . . . So give the son of a bitch what he wants." But then it works too well. Pohl's utopia is by no means instant, but given UTM the rest goes like clockwork. The end result is a novel—really a series of five novelettes—that reads too often like a tract. The subplots are good, but the main plot is all message.

C. J. Cherryh's **Chanur's Venture** is a sequel to *Pride of Chanur*, in which a loose league of alien civilizations first encountered a human being. Now that human, Tully, returns, bearing word that humans wish to deal. He still isn't too good at the local languages, so center stage is occupied again by Chanur's own folk, the leonid hani, and the mohendo'sat, both quite human now in their outlooks. The tale reports their futile efforts to keep Tully out of the hands of the predatory kif. The next in the series, *Chanur's Revenge*, will presumably report Tully's rescue.

Unfortunately, *Venture* fails to rise much above the level of space opera. Where *Pride* satisfied in its development of a lion-based alien psychology, this book emphasizes the human similarities of the aliens, except to put a misfit hani male on Chanur's ship. The result is less appealing.

Joel Rosenberg's **Ties of Blood and Silver** is something more. The world of Oroga is divided between the ultrawealthy city of Elweré and the slum and countryside of noncitizen peons. Protagonist David was stolen from Elweré as a child and raised as a thief in the slums. He's a good thief, too, and one of his heists puts all the energies of the local slumlord after him. He escapes by burglarizing an alien jewelsmith who, instead of promptly eating him, recognizes in him the ability to share appreciation and perhaps join its clan.

I tell you no more, for Rosenberg is a skillful writer of fair promise. *Ties*, his third novel, is derivative, owing much, perhaps, to Alan Dean Foster, but it embodies some nice insight into the nature of the bonds between intelligent beings. Support him. Buy the book. And wait to see what he does next.

Is it fantasy? Is it historical fiction? It's certainly not SF, but it does deserve at least brief mention in this magazine. It's Robert Bloch's **The Night of the Ripper.**

Bloch first came to public attention with "Yours Truly, Jack the Ripper" in 1943. Now, 41 years later, he returns

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to his origins as a writer with a full-scale docudrama, and it's gripping, gory stuff. It's not for the bodice-ripper fans, either, for Jack didn't pay much attention to bodices. He liked juicier stuff, and Bloch shows it all to us, with details straight from the public record and ambience that feels grittily true to the period. Only the story is fiction.

The story centers on Mark Robinson, a young American doctor working in London, interested in the new field of psychiatry. Smitten by a young nurse who evades him, he pursues her, while an ulcer-ridden police detective eyes him and his bloody-minded medical colleagues suspiciously. Unfortunately, and unlike the true history of the case, life leads him directly into the arms of the Ripper. We learn who, according to Bloch, the Ripper truly was, and why his name was never made public.

The story has its relevance for today, for the Ripper was one of the first private mass murderers and, as the detective says, "America is young yet. . . . Wait and see." At the same time, we see the world in a more innocent age, when blood-obsessed psychopaths needed no ideological justification for their acts. To my mind, the Ripper, while evil, is less evil than any terrorist.

Read the book. And laugh at yourself when you hesitate to go out at night.

It Came from Schenectady is a collection of short stories by Barry B. Longyear, eight from the 1979 and three from the 1981 *Asimov's*. My favorite was "The House of If," which deals with how 20-year prison sentences could be served in moments if there were a way to make the convict's mind perceive those moments as years of subjective, solitary confinement. The hero is a media star, a writer whose shtick is to prove every prison escapable. He faces an engineer penologist whose shtick is to make an escape-proof prison. And their reconciliation is what makes the tale so fine.

In **Phoenix in the Ashes,** Joan Vinge offers us the title story, set in a post-holocaust world where a Brazilian rubble-prospector goes to the Los Angeles area seeking new sources of metal and oil. His copter crashes, he develops amnesia, and he finds true happiness in the love of an outcast woman. It is a warmly empathic tale, but that is Vinge's hallmark, and we see it again in "Psiren," "Mother and Child," "The Peddler's Apprentice," "The Storm King," and "Voices from the Dust." Some have appeared right here in *Analog*, some elsewhere, and all are good.

A most excellent collection of ghost stories is Russell Kirk's **Watchers at the Strait Gate.** Last in the book, the title story recounts the last encounter of an aging priest with one of his wandering sheep. Competing with it for literary supremacy is "The Invasion of the Church of the Holy Ghost," in which Azrael defends a holy man in a holy place. The rest get no superlatives only because they dim by comparison.

Even if you don't care for ghost stories, buy Kirk. His are the pure quill, with authentically musty archaicisms and all, but his are also warm, empathic, and humane.

Rudy Rucker's **The Fourth Dimension** is a breezy, readable popularization of its topic, taking the reader from Flatland to Hypersphereland and beyond, with plenty of stops along the way. Rucker avoids the difficulties that come with the math of more abstruse treatments, he illuminates his words with numerous apt quotes, and all in all, he

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gives us the ideal companion piece for Dewdney's *Planiverse* (reviewed last November).

Finally, we have **Mutual Assured Survival,** by Jerry Pournelle and Dean Ing who, with their publisher, Jim Baen, are all members of the Citizens Advisory Council on National Space Policy. The book's title is their alternative to the guiding principle of present "defense" policy: Mutual Assured Destruction, or MAD. The book is the result of a Council working session held in the summer of 1983 at Larry Niven's home in Tarzana, California. Present were not only SF folks, but also generals and scientists and engineers. Their aim was to evaluate the workability of President Reagan's "Star Wars" proposal for orbital defenses against ICBMs. Not surprisingly, they and this book conclude that such defenses are feasible. The book then goes on to talk about all the glorious benefits to come once the human species has a construction-oriented toehold in space.

For us, this is preaching to the converted. But there are a lot of people out there—including technical, military, and scientific people—who think it impossible to mount an even partially effective defense against nuclear war, foolishly destabilizing to try, and a waste of resources to attempt to step off the planet.

Pray that they read the book. I find it perhaps too breathlessly and insistently optimistic, but I'm much more inclined to believe it than not, and I think it could have a highly salubrious effect. *If* the right people read it. ■

ON GAMING

(continued from page 137)

cation cards, several short folders with a total of 16 pages of referee's notes, 12-page reference book on the Bowman asteroid system, and 12 page Belter's (miner's) handbook.

You can either use the character you have already been using in previous games, or generate a brand-new character, or use one of the twelve pre-generated characters provided. In addition to the specific adventure outlined, there's enough data in these booklets for a referee to design several adventures within the Bowman asteroid system.

Koenig's Rock is a lawless frontier city in a remote corner of the Imperium, and it offers the players much danger and potential reward. A small military outpost, an archeological dig site, and many unexplored planetoids make up the Bowman system, which has been nicknamed "an interstellar junk heap."

You can try your hand at prospecting in the area, seeking rumors and directions to suspected rich mineral strikes. Or you might be conducting a scientific research mission. Perhaps, as a military crew, you seek information about a ship that crashed somewhere in the system in a space battle during the Frontier War. All these, and more, are possibilities using the information provided in *BeltStrike*.

Although the statistics for characters, encounters, etc., are for use with the *Traveller*® role-playing game, much of the material in both *Aslan* and *BeltStrike* can be adapted to other science-fiction role-playing games.

Even if you're not inclined to modify data for another SF game, or if you don't role-play at all, the story lines and information are quite interesting. *Aslan* and *BeltStrike* are worth reading. ■

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brass tacks

Dear Stanley:

Christopher Dunn to the contrary notwithstanding, the methods by which ancient Egyptians quarried stone, sawed wood and stone, and bored holes are well known. They have long been investigated and are well documented by archaeological finds and tomb paintings. Those techniques are among the least mysterious things about the Pharaonic Egyptians.

The Egyptians quarried by the same methods (save for lack of iron) that have been used thence down to the present century and may still be practiced somewhere. To split off a limestone block, the quarryman pecked a series of slots along the intended line of cleavage with a copper pick, surface-hardened by hammering. Then he inserted wedges into the slots: either hardened copper between feathers of soft copper, or wooden wedges which were then soaked in water so that wood, expanding, split the stone.

To extract a block of granite, the quarrymen dug a trench around the block by bashing the stone with grapefruit-sized balls of hard basaltic rock (dolerite or diabase) and sweeping away the rock dust. When all but one face had been cleared, the block could be split off as with limestone. This method is shown not only by tomb paintings but also by many worn-down stone balls found in the quarries.

For drilling, they used a simple bow drill, as have many others such as the pre-Columbian Amerinds. The drill could be either a wooden dowel with a flint bit, or a sheet-copper tube with sand or corundum for the abrasive, flushed down the central hole and out the sides by water. As for sawing, the Egyptian saw had a slightly hooked handle and the blade had a straight back and a convex edge.

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By cold hammering, copper can be given about the hardness of wrought iron. It can be used on stone only at the cost of much labor and frequent resharpening. Indications are that this is what was done. While these tools are abundantly illustrated in funerary art and their nature is confirmed by the markings they left on materials, the tools themselves are rare. The reason is that copper was costly, and scrap was collected to melt and re-use.

As for Mr. Dunn's idea of estimating the speed of drilling by the time it took a driller to correct a deviation from true, I fear he is projecting modern Western ideas of efficiency, accuracy, and economy of time on the men of King Khufu's generation. Anyone who has traveled in Muslim lands know that the inhabitants have a way to go before catching up with the West in these matters. The "secrets" of the ancients' public works were three: the diligent application of such technical principles as they knew, such as the 3:4:5 triangle for making a right angle; lots of cheap labor; and plenty of time. See Singer, Holmyard, & Hall: *A History of Technology*, vol. 1, pp. 188-94, 475-82, 601-13; R. J. Forbes: *Studies in Ancient Technology, The Story of Engineering*, pp. 3-11.

L. SPRAGUE DE CAMP

The author replies:

As Mr. de Camp pointed out, primitive methods of cutting stone are well known, which was why they weren't given much space in my article. I would like to thank Mr. de Camp for his consideration in bringing them to the reader's attention in greater detail.

While Mr. de Camp hasn't said (or proved) that I am wrong in my evaluation of the subject Egyptian artifacts, the general tone of his missive assumes supersedure for the manufacturing methods that we are all well aware of and which Mr. de Camp amply describes in his book *The Ancient Engineers* (Doubleday, 1968).

And, I suppose, this is where I am at a loss; for Mr. de Camp hasn't addressed any of the questions that I put forward in the article, even though a plea was issued on page 78 for a primitive method by which the artifacts in question could have been created: "Think! Is there a primitive method of cutting that would create all the characteristics of the granite artifacts? If there is, the answer that follows could be disproved."

Knowledge and understanding is imparted, transmitted, and experienced. As Mr. de Camp will surely agree, there are many levels of understanding, with engineering offering more variety of expression on every level than any other discipline. Having worked in manufacturing as a craftsman and an engineer (and more recently in management) for more than 23 years, I take exception to Mr. de Camp's tutorial on the simplistic manufacturing methods of the ancient Egyptians if he is applying them to the artifacts that were discussed in "Advanced Machining in Ancient Egypt."

It seems to me that Mr. de Camp glossed over the article without giving it serious consideration. He certainly didn't accept my challenge to think! William Flinders Petrie, influenced by his grandfather, who I might add was an engineer, didn't drawn conclusions in the comfort of his study but consulted with experts in the field at that time. He was unable to find answers and was wise enough to admit it.

With respect to Sir William's research, my article was founded on the fundamental principles of machining; namely, that hard materials can cut soft material but not vice-versa. Soft materials can break hard materials, with

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pressure. That's all. Several years ago, when I read that the ancient Egyptians cut thousands of tons of granite with hardened copper chisels and adzes, I conducted an experiment. Granite is abundant in manufacturing. The hardness and stability of granite makes it ideal as precision inspection surface plates. The work-hardened copper chisel which I had fashioned was used on the most vulnerable point of the granite—a corner. The results were that I had a piece of copper with a concave radius where the cutting edge should have been. There was something else, though, that was quite interesting. The copper residue that was imparted in the granite seems to want to stay there. I don't remember any writings that state that the granite quarried by the Egyptians was impacted with copper—which would be the case if traditional dogma had any foundation in reality.

Corundum incorporated with copper is a logical alternative, and it was Petrie's leaning toward this possibility that I was addressing. The copper could be used as a matrix for the harder substance which was to be used to cut the granite. Using a simple bow-drill, along with energy and fortitude, it would certainly be possible to drill a hole in any substance you have the will to attack. However, the artifacts cited in my article do not reflect a primitive simplistic method. I hope that Mr. de Camp goes back and reads this section more closely and accepts my challenge and presents a method that has more logic and is more fitting with the characteristics of this hole.

Regarding my interpretation of the speed of the Egyptian's machining process, Mr. de Camp focuses on the drilling process and ignores a precedent that is evident in the sawing of the blocks prior to drilling. The "sarcophagi," housed inside the Great Pyramid and the Second Pyramid on the Giza Plateau, display saw marks along the side that are parallel with the edges. This means that they had to have used a 9-foot saw to cut through. On these blocks there is evidence that the saw had cut too deep into the side, been backed out and continued to cut again. On the Great Pyramid sarcophagus, the evidence shows that this happened twice. As there were saw lines and not chisel marks on these blocks, I am assuming that the correction to the errors were made with the same saw that created them. Based on my own experience with hand saws and mechanized saws, this was a strong indication to me of the latter. To correct a deviation in the sawing direction with a hand saw without exerting too much pressure and forcing the blade back into the original cut, it would be possible to tip the blade and make an angle cut until the length of the blade had sufficient support to overcome the tendency to follow the original track. However, on the granite sarcophagi the saw lines are all in one direction, which is surprising. But, no matter, if I had labored over a block of granite overcoming an error, I'd make sure I didn't make the same mistake twice. Which was the point I was trying to make.

Mr. de Camp states that diorite balls were used to quarry the thousands of tons of granite that were used in construction in the ancient Egyptian's time, and yet he ignores the diorite artifacts that evidence true turning on a lathe. Much more technically advanced than bashing, don't you think?

Mr. de Camp is quite correct in accusing me of projecting modern Western ideas of EFFICIENCY and ECONOMY on the technical principles of the ancient Egyptians, but he is at fault when he includes ACCURACY! If I were projecting modern Western

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ideas of accuracy in construction on the pyramid builders, we would find that the Great Pyramid's base might be aligned within 15 inches (based on modern building codes which allow .02 inches per linear foot) instead of the 7/8 inch that was recently surveyed. We might also find that the Descending Passage in the Great Pyramid might be off a little more that .010 inches in 150 foot length or 1/4 inch in 350 feet. Perhaps, too, they wouldn't have seen the reason to cut the casing stones of the Great Pyramid within .010 inches and fit them within .02 inches with a superior mortar in the joint. And why would they bother to make sure that the angle on all four sides of the pyramid were within 2 minutes of a degree of each other? No, Mr. de Camp, I was not projecting modern Western ideas of accuracy on the ancient pyramid builders. They were far superior! Evidence of this can be seen in Bedford, Indiana where they recently attempted to erect a limestone pyramid. Like the Japanese team that attempted the same task in Egypt, the Hoosier masons with their modern equipment had to give it up!

CHRISTOPHER P. DUNN

Dear Stan:

The September 1984 issue was an especially strong and interesting one.

Do I detect a couple of themes in the fiction? Delaney and Steigler's "The Light in the Looking Glass," Vinicoff's "Repairman," and (to some extent) Schenck's "Silicon Muse" all dealt with the interface between the human mind and the computer. Moreover, Vinicoff's story and Zahn's "Return to the Fold" both dealt with the psychological problems of loneliness.

I thought that "Silicon Muse" was an excellent story: interesting from the outset and constantly surprising. The story developed in a way that was consistent with the underlying idea, and the development served to reinforce that basic idea. A first-rate job.

In my opinion, though, you let Zahn off the hook too easily. He had a fine idea: that technicians on starships are genetically/psychologically engineered to be loners. But simply promising that the engineering might be reversable, or at least modified, does not do justice to the basic premise. How much stronger the story would have been if we discover that the space station personnel have been similarly engineered to fit into their jobs. And the colonists on the planet have been tinkered with so that they can live happily in their less-than-Earthlike world. And that *all* colonists, administrators, starship techs, etc. are "fine tuned" to be fitted for their positions in life—and no other positions. Who's in charge? Is this an evil scheme or a necessary part of interstellar colonization? Who's gaining from this? Who's being hurt? The basic material for a fine novel is there. I hope Zahn digs into it further.

I greatly enjoyed Albert Berger's article on the Manhattan Project's security investigation of *ASF*. And your editorial seems to say that anyone who seeks political office shouldn't be trusted with same: a feeling the Founding Fathers shared, I believe.

You may remember that I proposed a method to alleviate some of the problems that afflict our body politic in my editorial, "Crazy Ideas," in the February 1974 issue. I suggested that *no* politician in any office be allowed to hold that office for more than two consecutive terms, and that every citizen should be drafted for two years of public service. The basic reason behind the second concept is to have a large number of "draftees" working in every pub-

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lic office in the land, keeping an eye on the "professionals."

I was interested, also, in Tom Donaldson's essay, "The Galaxy Before Man," partly because it makes a good companion piece to my own "Galactic Geopolitics" (January 1972 *ASF*). I don't see how he can postulate aged stars of high metallicity, when there is no evidence for this. Aside from that, Donaldson seems to reinforce the points that I made: (1) The oldest star systems cannot be abodes for life; (2) Our own solar system may be among the earliest to produce a technological civilization; and consequently (3) We probably won't find a civilization near our own level of development anywhere near us.

Lord, it's fun to be able to read *Analog* for pleasure once again!

BEN BOVA

Dear Dr. Schmidt:

I respond to your editorial " 'Tis the Season" in the September issue.

It is *not* a procedural detail (page 7) to specify the people who will judge the performance of an elected leader—or anybody else. The same comment applies to your suggestion a few paragraphs earlier, that people who should not exercise power be kept from office by psychological testing. Just *who* does the testing? *Quis custodiat?*

Your comments on the way our system runs now reveal the same weary cynicism so many of us have shared. But what is the alternative? Not too long ago an engineer, writing in your magazine, suggested a miraculous revision of the national finances and all of industry by simply having the electorate choose high-minded people, not interested in power, to run everything. Who in the world did he think would be attracted to such elections but those who want power? And in your ideas, who would become psychological testers?

While I am a college professor, I have for some time chaired a very small public and official body—the County Library Commission here. We spend about a half-million dollars a year, really small potatoes, and our Commission has 7 members including myself. Nevertheless—we have a lawyer, and he is at every meeting, and his advice is needed at every meeting to keep us out of difficulties and in compliance with the rest of the political/governmental world.

So while I sympathize with your wish to minimize the activity of lawyers, I respond that it is the size and complexity of government that forces all of us in public life, even on a small scale, to depend on them. A public body which is composed of people who "do other things," like ours, needs a lawyer. And so does the Mosquito Commission, and the Parks/Recreation Commission, and so on. Any of us who tried to do without continual legal advice would be in hot water very quickly, with huge numbers of regulations and policies impacting on us every day. Reducing *greatly* the size of government—well, now, that would change the rules of the game, but it will never happen. Carter and Reagan both talked about it and both failed.

In fact, I am astounded that the system works at all. It does so only because of the day to day dedicated labors of skilled people by the millions. There is no alternative that does not have worse features. (How about rule by the first 2000 people in the phone book?)

RINEHART SKEEN POTTS

Glassboro, NJ

And I can recall very few cases where anybody has found a better alternative to existing ways by saying flatly at the outset, "There is no alternative!" How about, "I haven't been able to see an alternative so far"? ■

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a calendar of analog upcoming events

21-24 March
AGGIECON XVI (Texas A&M SF conference) at College Station, Tex. Special Guest—Patricia McKillip, TM—Ed Bryant, Artist Guest of Honor—Jim Christiansen. The usual plus special Trivial Pursuit. Info: AggieCon XVI, Box J-1, MSC, Texas A&M University, College Station TX 77844. 409-845-1515 (ask for Cepheid Variable committee).

22-24 March
MIDSOUTHCON IV (Middle South regional SF conference) at Quality Inn Airport, Memphis, Tenn. Guest of Honor—Frederik Pohl, Artist Guest of Honor—Keith Berdak, Fan Guest of Honor—Ken Moore, Other Guests—Sharon Webb, Suzette Haden Elgin. Registration—$15. Video, Maskerade, Art Show, etc. Info: Midsouthcon 4, % Richard Moore, 1229 Pallwood, Memphis TN 38122.

12-14 April
DELTA CON OF NEW ORLEANS (New Orleans area SF conference) at Airport Travelodge, Kenner, La. Guest of Honor—Mike Resnick, Special Guest—Jo Clayton, TM—John Guidry, Fan Guest of Honor—Jim Mule. Poetry and video contests, plus the usual. Registration—$20 until 5 March 1985, $25 thereafter, banquet $10. Info: DELTA CON, Box 640205, Kenner LA 70064. Note: do not confuse this convention with Delta Con [Baton Rouge] which is a Star Trek conference scheduled for September 1985.

24-27 April
General meeting of the American Physical Society at Washington, D.C. Info: A.P.S., 335 East 45th Street, New York, NY 10017.

26-28 April
Con★Tretemps 4 (Nebraska SF conference) at Old Mill Holiday Inn, Omaha, Nebr. Guest of Honor—Vonda N. McIntyre, Artist Guest of Honor—Carl Lundgren, Fan Guest of Honor—Bruce Miller, TM—Rusty Hevelin. Registration—$14 until 31 March, $17 at door. Info: Box 45, Omaha NE 68101.

22-26 August
AUSSIECON II (43rd World Science Fiction Convention) at Southern Cross Hotel, Melbourne, Victoria, Australia. Guest of Honor—Gene Wolfe, Fan Guest of Honor—Ted White Registration—$30 supporting; $60 attending (more at the door). This is the SF universe's annual get-together. Professionals and readers from all over the world will be in attendance. Talks, panels, films, fancy dress competition, the works. Join now and get to nominate and vote for the Hugo awards and the John W. Campbell Award for Best New Writer. Info: Aussiecon Two, GPO Box 2253U, Melbourne VIC 3001, Australia (use airmail); Fred Patten, 11863 West Jefferson Blvd. #1, Culver City CA 90230 (membership info); jan howard finder, Box 428, Latham NY 12100.

30 August-2 September
NASFiC 1985 (North American SF Convention, officially The First Occasional Lone Star SF Convention & Chili Cook-off) at the Hyatt Regency Austin and Palmer Auditorium, Austin, Texas. Guest of Honor—Jack Vance, Artist Guest of Honor—Richard Powers, Fan Guest of Honor—Joanne Burger, TM—Chad Oliver. Registration—attending $35 until 31 December 1984, then $45; supporting—$15. Info: NASFiC, Box 9612, Austin TX 78766.

—Anthony Lewis

Items for the Calendar should be sent to the Editorial Offices six months in advance of the event.

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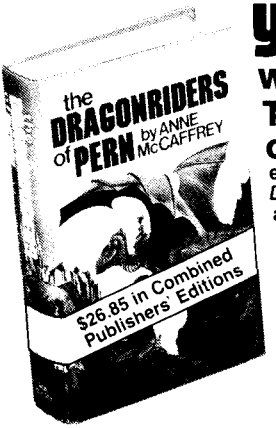

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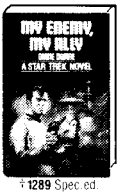

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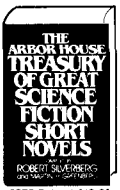

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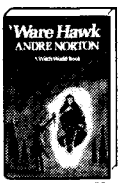

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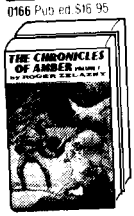

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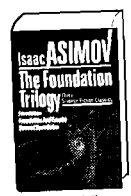

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